the OIL AND GAS JOURNAL

BRODERICK & BASCOM

Yellow Strand®

PREFORMED WIRE ROPE

Does your *protection* extend to wire rope when schedules are tight?

Wire rope that combines strength, flexibility and ease of handling belongs in the category of safety equipment. These qualities are bred into Preformed Yellow Strand. But look to this long-lived rope, too, for help in warding off intangible hazards. When you are pressing to beat a deadline or protect a narrow margin, top-grade steel wires and skilled engineering will be working on your side: resisting premature replacement . . . keeping production high . . . holding job costs in line. Say the word and one of our wire-rope engineers will gladly check your installations.

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St. Louis 15, Mo.

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THE CONTINENTAL SUPPLY CO.
Mid-Continent and Rocky Mountain Distributors—Stores in All Active Fields

McJUNKIN CORPORATION
Charleston, West Virginia, and Branches

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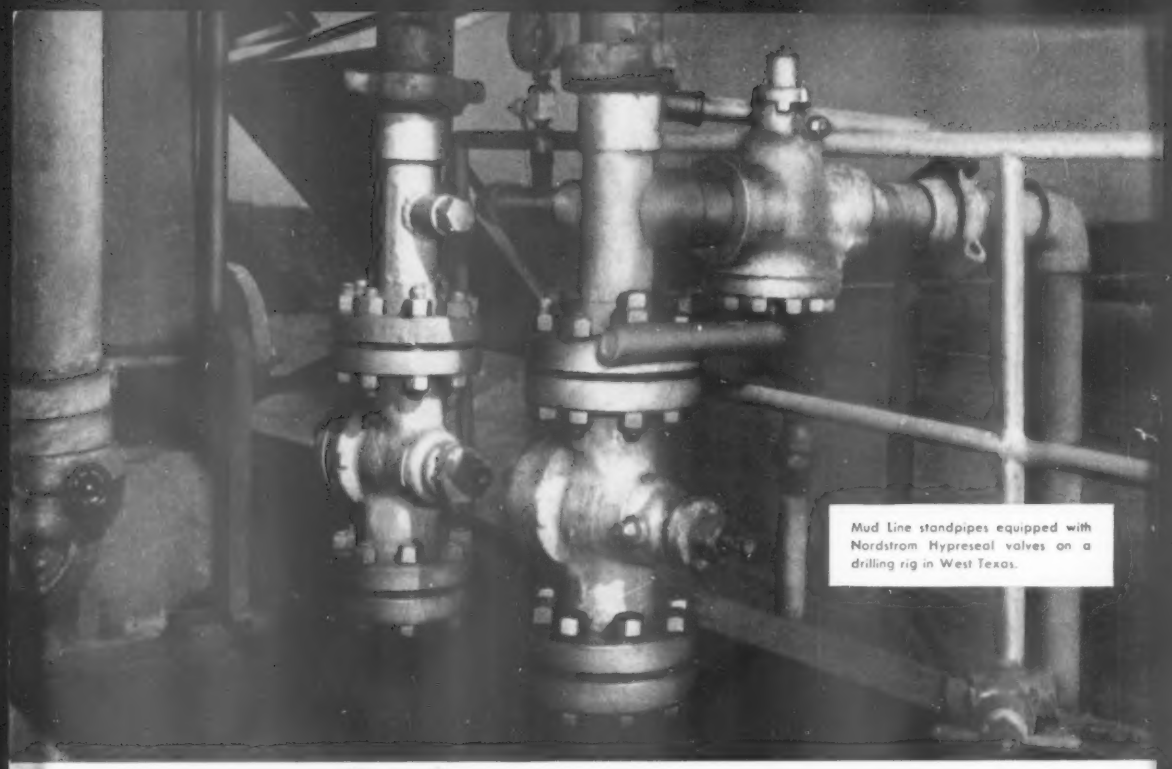

Mud Line standpipes equipped with Nordstrom Hypreseal valves on a drilling rig in West Texas.

HOW *Lubricaut* MAKES NORDSTROMS LAST LONGER IN DRILLING SERVICES

Most valves wear out very quickly when they handle erosive drilling mud at high pressures. Why do Nordstroms last so much longer?

There's no single answer to this question. A number of factors account for Nordstrom Hypreseal Mud Line valves' exceptionally long life:

1. **A protective Merchrome coating, developed by Nordstrom, completely covers contact surfaces of plug and body providing almost impenetrable protection against the erosive action of drilling muds.**

2. **Protected by a film of lubricant, the valve seat is never exposed to the line fluid.**

3. **There are no pockets or recesses in which sediment can collect.**

4. **Nordstrom Hypreseal valves with Nordcoseal lubricants are especially designed for high pressures such as those found in mud line service.**

If a valve had any one of these advantages, it would outlast the average valve in mudline service . . . but . . . Nordstrom Hypreseal Mud Line valves—designed expressly for tough drilling services—embody *all* of these features.

Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania.

ROCKWELL Built
Nordstrom Valves
Lubricant-Sealed for Positive Shut-Off

Another ROCKWELL product

Wherever you are in the oil fields, you're close to a supply house with Nordstrom valves and Nordstrom service.

the OIL AND GAS JOURNAL

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In Brief...

1. COMPACT COMPRESSOR STATIONS. Station layout is such that cooling units for engine jacket water are located immediately adjacent to the compressor buildings, with power takeoffs from each engine running to individual cooling fans. Exhaust mufflers are mounted on the flat-roofed compressor building. Space between cooling-unit bays is devoted to fuel-gas meter runs, storage use, and washrooms. All piping is located aboveground, either on concrete piers or overhead stanchions.

•

2. CRUDE VAPORIZATION LOSSES CUT. Losses of crude oil due to vaporization from storage tanks can be reduced by cooling the oil prior to sending it to lease-tank storage. Total installed cost for cooling system in typical application is $888. Savings result in a 28-day payout, with more than $56,000 being saved over a 5-year period.

•

3. HYDRAULIC UNITS enable drilling-rig engines to be used with maximum effectiveness, thus making available more horsepower from an engineer of a given rating. When using hydraulic couplings, load is accelerated smoothly and steadily to maximum speed without stalling. Torque converters reduce shock loading and increase efficiency and ease of operation. Rigs with these units have lower operating and maintenance expense and higher second-hand value.

•

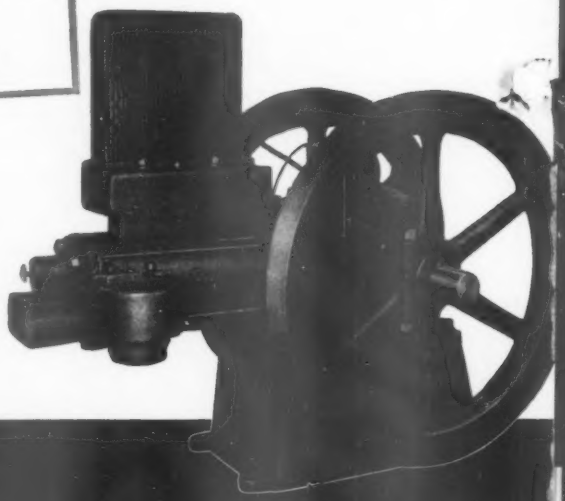
4. DIRECT-FIRED HEATERS in natural-gasoline plants provide for higher thermal efficiencies and result in reduction in number of shutdowns. Radiant-convection type heaters can be operated with thermal efficiencies up to 89 per cent and with annual savings up to $22,000 per heater. The direct-fired heater is used for heating rich absorption oil, vaporizing hydrocarbons, and reboiling liquids.

•

5. FASTER ORIFICE-CHART CALCULATIONS... A modern adding machine used in conjunction with the Rockwell integrator results in time savings up to 50 per cent in calculation of orifice-meter charts. With this system, the operations of recording integrator index stop, index start, and difference are eliminated. Only hourly coefficient and delivery are recorded on the back of the chart by the operator. Difference reading is printed on chart with adding machine.

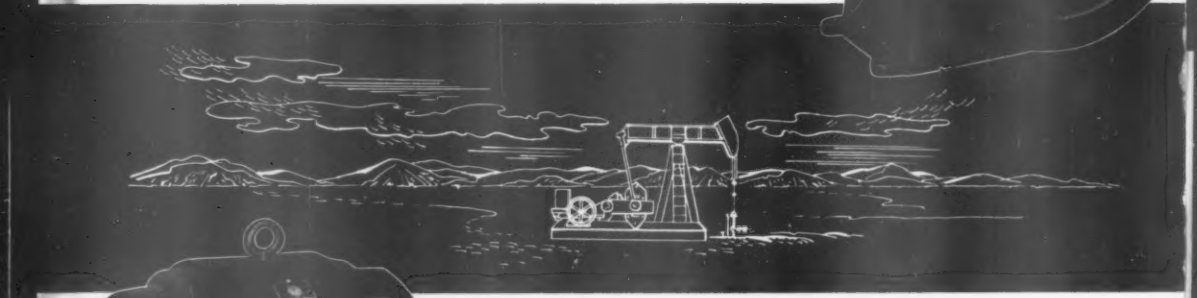
For Oil Well Pumping

FAIRBANKS-MORSE
serves you best!



If you choose engines,

the famous Fairbanks-Morse "ZC" is your best choice for economical, efficient service. The big, *extra* heavy flywheels of the "ZC" assure considerable savings in gas or gasoline . . . protect engine and driven equipment against excessive wear. The simple, rugged, single-cylinder "ZC" design means easy maintenance . . . no complicated parts to cause trouble.



If you choose motors,

the Fairbanks-Morse General Purpose Motor is your choice for stand-out . . . stand-up performance. Check the exclusive, indestructible "Copperspun Rotor" . . . unique cross-flow ventilation . . . protected, one-piece cast frame and it's easy to see why they are tops for the heavy starting loads and long-period, peak-capacity operation of oil field service.

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since Fairbanks-Morse manufactures both motors and engines, we are able to recommend, without prejudice, the exact power choice that will serve your pumping needs best. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

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Macwhyte 6x25F PREformed Monarch Whyte Strand Wire Rope with I. W. R. C.

How many moving parts?

- In this particular rope construction there are 199 individual wires. Each is a carefully designed "moving part."
- Outside wires are one size. Inside wires are another size. Core and filler wires are still other sizes.
- Altogether, 8 different sizes of wire are used, and each has a specified strength, toughness and flexibility.
- Macwhyte has specialized in the manufacture of wire rope like this for over half a century.
- To assure highest quality, all stages of wire manufacture and rope fabrication are closely controlled.
- An exact "breathing space" between each wire is provided in order to increase flexibility.
- Each wire is protected with a film of lubricant that is force-fed *cold* during the fabricating.
- Since any piece of wire rope is a complicated piece of machinery, precision is as important in its manufacture as in the making of a fine watch.
- In designing and manufacturing its thousand and one wire ropes, Macwhyte exercises all the special care that assures long service and low cost to you. May our engineers recommend the right rope for *your* equipment?

MACWHYTE WIRE ROPE

THE RIGHT ROPE FOR YOUR EQUIPMENT

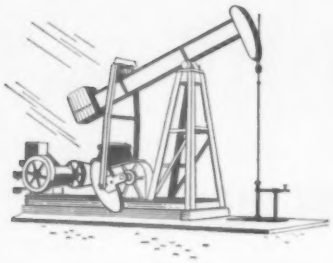
Ask for G-15 Handbook

MACWHYTE COMPANY KENOSHA, WIS.

1032

MACWHYTE COMPANY

2016 Fourteenth Avenue, Kenosha, Wis. Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope and Wire Rope Assemblies. Mill depots: New York • Pittsburgh • Chicago • St. Paul • Fort Worth • Portland • Seattle • San Francisco • Los Angeles • Distributors throughout U.S.A.



When your production requires pumping or when you are replacing equipment to cut operating costs . . .

Ask your supply store for

Witte Engines

Precision-built Witte Oilfield Engines will give you constant, dependable pumping power for many years to come. These single cylinder, gas-gasoline models are of the horizontal, water-cooled, four-cycle type, and are equipped with condenser cooling, roller type main bearings, and removable wet cylinder liner for easy replacement in the field.

Model "B" Engines operate economically over a speed range of 450 to 900 rpm, developing 5 to 10 horsepower, while the Model "C" Engines have a speed range from 350 to 750 rpm and develop from 7.8 to 15.5 horsepower. The low engine speeds are largely responsible for the extra life of Witte Engines, and contribute greatly to their economy of operation.

See your favorite oilfield supply dealer about Witte Engines, soon.

WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORPORATION
Kansas City 26, Mo.

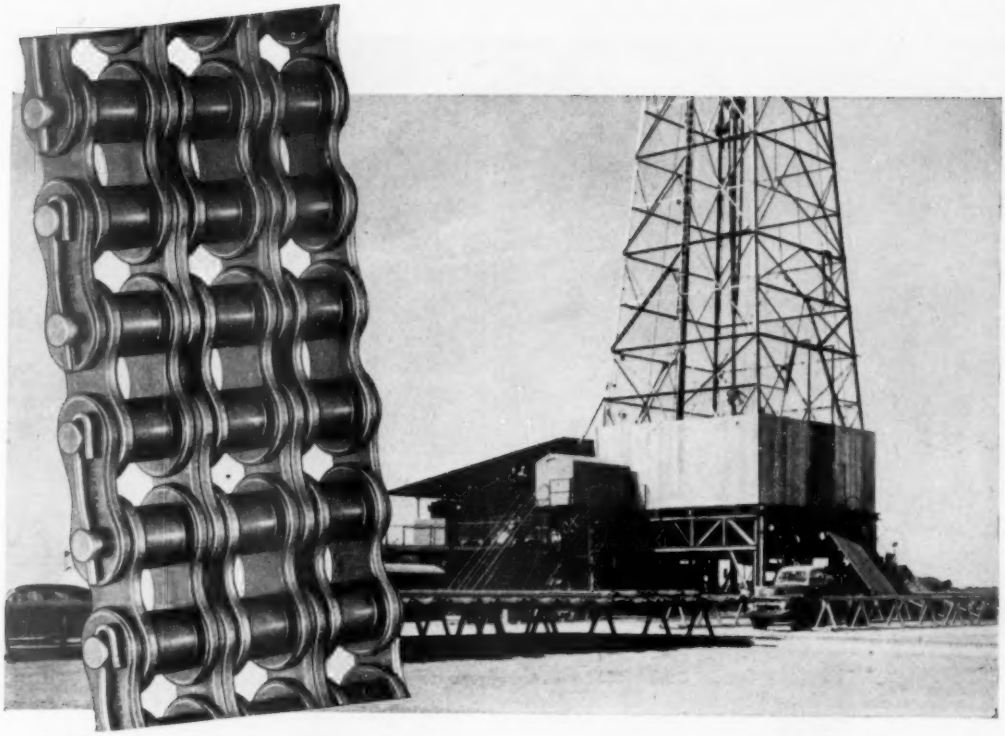
WITTE ENGINES

USS

Gas-Gasoline — Models from 5 to 15.5 hp

Full diesel — Models from 3.75 to 12.5 hp

UNITED STATES STEEL



Shot Peened Rollers

Thousands of steel balls hammer the case hardened rollers, give them extra fatigue life and added ability to withstand shock and impact.

Patented LINK-BELT E-Z Assembly

This feature permits easy coupling and uncoupling of multiple width chains right on the job.

For Years of No-Stop Power Transmission

Shot peening hammers long life, extra performance into Link-Belt Precision Steel Roller Chain. This is one reason why Link-Belt Chain rolls on and on at high speeds, heavy loads, frequent overloads, long after just average chain gives up the ghost.

Other long life factors are Link-Belt case hardened pins and bushings and manufacture to precision standards that guarantee absolute uniformity throughout.

There is a Link-Belt Roller Chain to solve your most difficult chain problem. Call the nearest Link-Belt engineer to give you all the facts. Specify Link-Belt where *no-stop power transmission* is demanded.

LINK-BELT

PRECISION STEEL ROLLER CHAIN

LINK-BELT COMPANY: Indianapolis 6, Dallas 1, Houston 1, Los Angeles 33, New York 7. Distributors in all fields. 12,782

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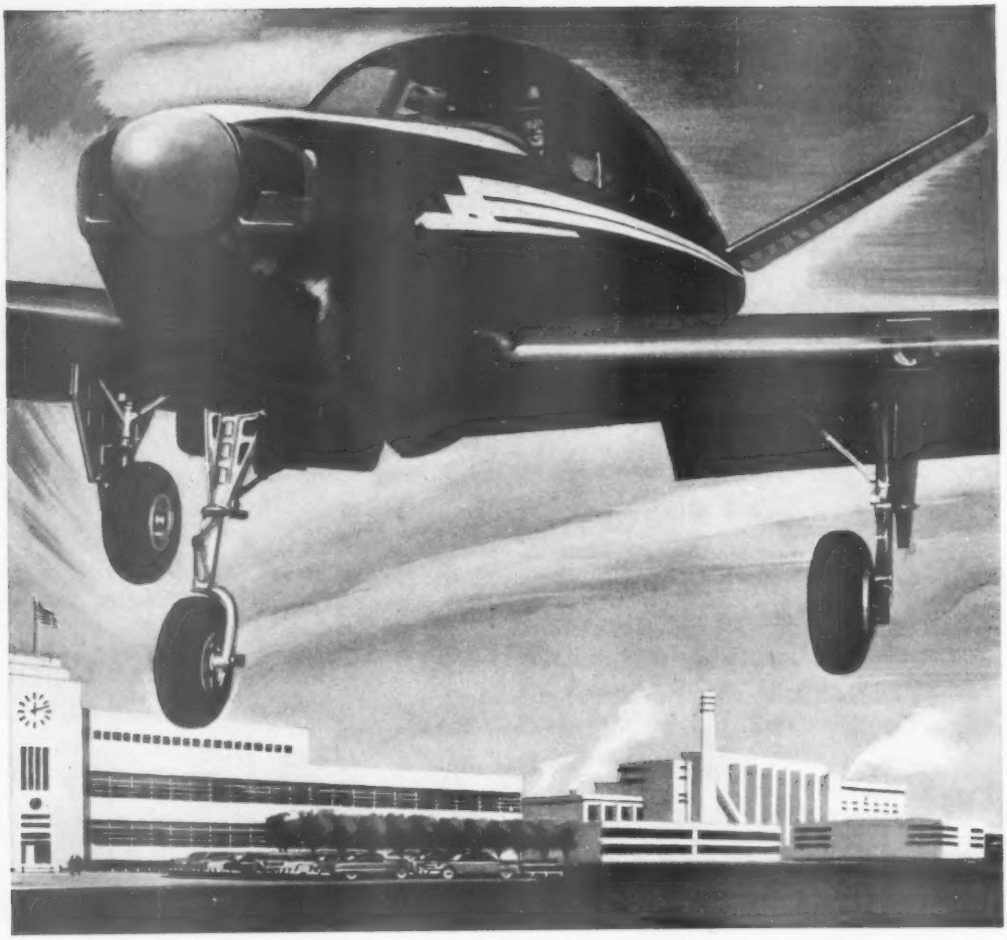


This man is landing a contract

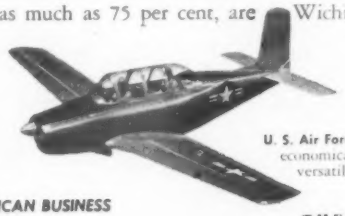
At 12:15 he learned about a sales opportunity—400 miles away.

At 2:45 he's on the spot via his company-owned Beechcraft Bonanza ready to do business.

You may say this is an unusual man, using unique methods. Just the opposite. Thousands of executives use Beechcrafts daily in just such fashion. They profit from anytime mobility of action, cut travel-time as much as 75 per cent, are away from their desks *less*, see their families *more*. For typical costs and operating data, call your Beechcraft distributor or write:

Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

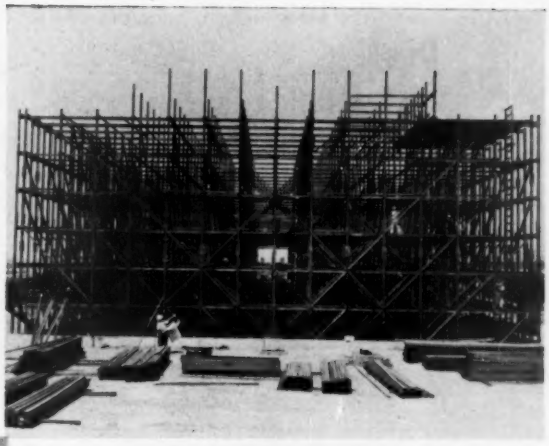
Beechcraft

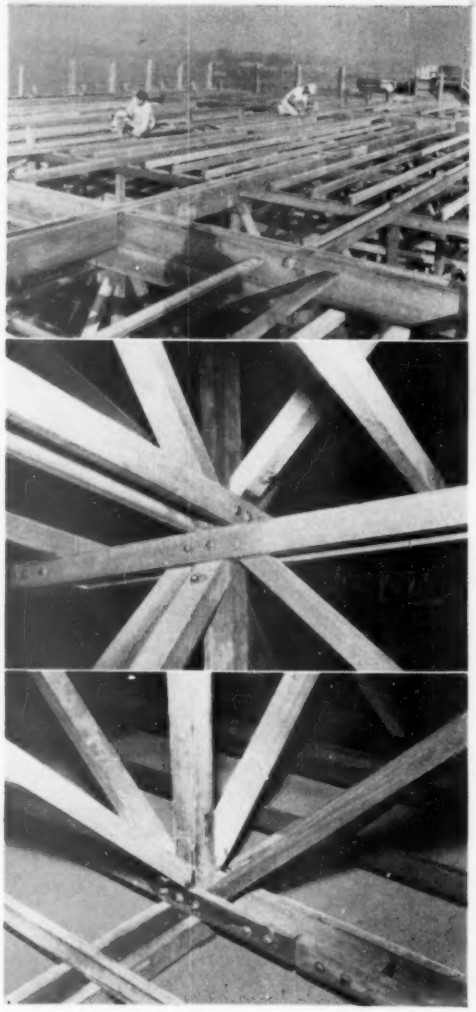


U. S. Air Force T-34A is the world's most economical military trainer. Adaptation of the versatile, reliable Beechcraft Bonanza.

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

MARLEY STRUCTURAL SUPERIORITY *means* PERMANENCE





For 25 years, Marley has put primary emphasis on structural engineering. Present excellent condition of many early Marley cooling towers attests the success of this policy.

Marley towers were the first to be constructed to withstand 100 mph wind load. Marley design today incorporates many exclusive features that mean added strength . . . longer service life. Typical is the Marley method of bracing each wall against external forces by diagonal members carrying horizontal forces directly to the foundation. Maximum rigidity is obtained by independently bracing each wall with diagonals only in compression.

FAN DECK FRAMING

Marley engineering combines structural elements to produce an unusually strong rigid fan deck—one that easily accepts any load imposed by operation and maintenance. Support members on very close centers, the heavy timber foundation for mechanical equipment and tower bracing diagonals all join in supporting the heavy tongue and grooved flooring, making a perfectly integrated structure.

TYPICAL FRAMING JOINT

This distinctive Marley structural joint is made without notching any members. Diagonal joints bear in compression (wood on wood) eliminating castings and plates subject to corrosion. All horizontal members are ruggedly supported by heavy timber ring connectors at this point.

INTERIOR BASE JOINT

At this important joint vertical, horizontal and diagonal members are joined. Diagonal bracing is framed to the base of column to avoid bending stresses and all columns are held in perfect alignment by interconnection with horizontal members in two directions. Here accumulated load is transferred to the foundation by this carefully engineered system of horizontal members and base anchorage.

The Marley Company

MARLEY

Kansas City, Missouri

More Push at the Blade!

NEW 15X DOZER! (No Pushbeam)

More Powerful, More Rugged, but Still Highway Width!

Higher, Faster Lift—full 39½ inches above ground. Unusually good center of gravity affords excellent leverage and maximum traction with blade in any position.

Deeper, Faster Bite—full 15½ inch drop below ground. Positive down pressure, elimination of "bounce", and steeper approach angle puts—and keeps—blade down deep.

Baker's revolutionary, no pushbeam, highway width 9X dozer proved that *it could be done!* Now . . . Baker presents a *bigger, more powerful* edition—the Baker 15X—combining the famous Baker "roll action" 96 inch-wide blade with the 109 drawbar hp of A-C's HD-15.

The successful result of painstaking design and exhaustive testing, the big-capacity 15X utilizes Baker's specially engineered hydraulic lifting mechanism to direct every ounce of horsepower to where it counts most—*at the dozer blade!*

Now! . . . ask your Baker, Allis-Chalmers dealer for complete information about this completely new Baker 15X.

THE BAKER MANUFACTURING COMPANY, SPRINGFIELD, ILLINOIS

Check These Features!

• Legal Highway Portability—only 96" wide • Big Yardage Moldboard • More Horsepower at the Blade • Sure Footed—greater track oscillation • Working Center of Gravity • "Operator-Ease" Control • Design for Easy Servicing • Lighter—Less Cost.

Always Look to Baker for the Next Advancement—First

In many areas -

a key to GREATER PROFITS!

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Flash Welded

TOOL JOINTS

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Three important factors make American Iron "Flash Welded" Tool Joints outstandingly dependable. They're DESIGNED RIGHT . . . MADE RIGHT . . . and INSTALLED RIGHT, with gigantic controlled surges of electricity welding tool joints to drill pipe — forming integral units!

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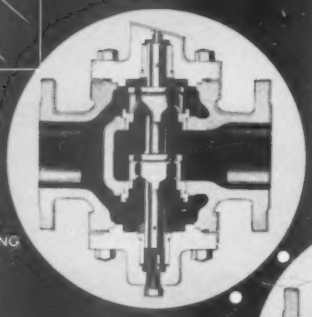
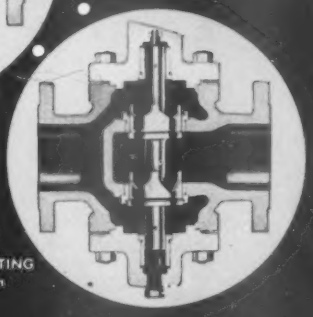
MANUFACTURERS OF A OIL FIELD EQUIPMENT

OKLAHOMA CITY U.S.A.

QUICK SHIFT

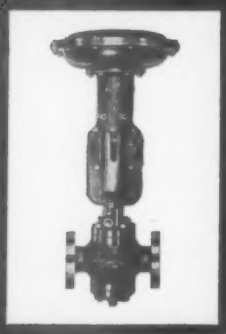


DIRECT ACTING
air to close



REVERSE ACTING
air to open

for easy field reversal of valve action



You can reverse the control action of the Honeywell Series 700 Valve by inverting the valve body and disc, and turning the travel indicator plate to its reverse side. It can be done in the field . . . easily and quickly, without extra parts or complex adjustments.
The Honeywell Series 700 wide band proportional control valve comes in a full range of styles and sizes . . . has *all* the features you look for in a fine valve.
Write today for your copy of Bulletin 700-2.

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Honeywell
VALVE PRODUCTS

First in Controls

Only POLYKEN PROTECTIVE COATINGS fight corrosion these 2 ways in a single wrap

12 mils of protection . . . In this magnified cross sectional drawing note how the heavy adhesive mass actually penetrates metal porosity—fills pits and voids.

Cover a pipe with Polyken Protective Tape Coating and, with just one simple operation, you have double protection, a stable adhesive and a *polyethylene* backing—each one an anti-corrosion barrier in itself.

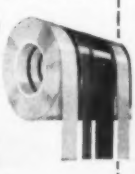
The first barrier of this coating is an extra heavy, 4 mil adhesive, which provides a superior bond to all metal surfaces as well as to its own backing. And this specially developed synthetic adhesive does more than form a tight bond—because of its thickness it actually penetrates a pipe's surface voids, pits and pores—fills them in with a material that provides excellent protection indefinitely over a wide range of temperatures and conditions.

The second barrier is a tough, elastic 8 mil *polyethylene* film, adding all the well-known properties of *polyethylene* to the protection already provided by the adhesive mass.

These two barriers, bonded together by a new process, is the solution to your corrosion problem. Polyken Protective Coatings are available in two colors: No. 900, black and No. 910, aluminum gray. Test samples and further information are available now.

TAILORED TO YOUR JOB

Polyken®



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Division of The Kendall Company

Polyken, Dept. OGC, 222 West Adams Street
Chicago 6, Illinois

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Company _____

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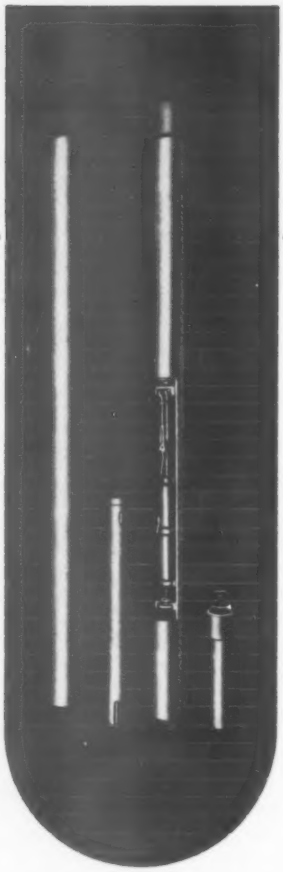
City _____ **Zone** ____ **State** _____



PRESSURE RECORDED MORE ACCURATELY

over 100,000 times!

HALLIBURTON'S

exclusive BOURDON TUBE

ONE OF MANY REASONS WHY HALLIBURTON'S BEST FOR YOUR DRILL STEM TEST!

When the BT's back on the derrick floor it provides the information that often decides whether or not your well's a producer. For this super-sensitive pressure recording device has no equal for accuracy in Drill Stem Testing – and only Halliburton has it.

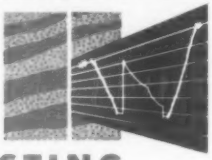
The Bourdon Tube is a complex, delicate instrument built with care and precision. It is hollow, with one end open to outside pressure. At this end is a flexible, rubber diaphragm. As outside pressure increases, the diaphragm is pushed inward, compressing the fluid inside the tube. And the tube, being coiled, attempts to straighten itself out.

The other end of the tube is closed and has a stylus attached to it. The tube's movements – straightening itself out or returning to normal – activate the stylus. This stylus rests on a coated metal chart and draws a path on the chart's surface to show the pressure encountered. As in all chart and stylus movements, the BT chart must move too. A small clock mechanism moves the chart while the stylus records the various pressure changes.

More than 100,000 tests have been made more accurately with Halliburton's Bourdon Tube Pressure Recording Device. It is used in addition to the standard Pressure Recording Device which is sturdy and reliable but lacks the sensitivity of the Bourdon Tube.

Get this greater accuracy at no extra cost on your next test. Phone your nearby Halliburton Testing Specialist who is only minutes away from you. Halliburton Oil Well Cementing Co., Duncan, Oklahoma.

HALLIBURTON



TESTING SERVICE

MORE REASONS WHY HALLIBURTON'S BEST:

- You Get Benefits of Big Research
- You Get Million Job Experience
- Your Test Can Start Minutes From Now
- You Get Real Personal Service
- You Get Advanced Highly Specialized Tools

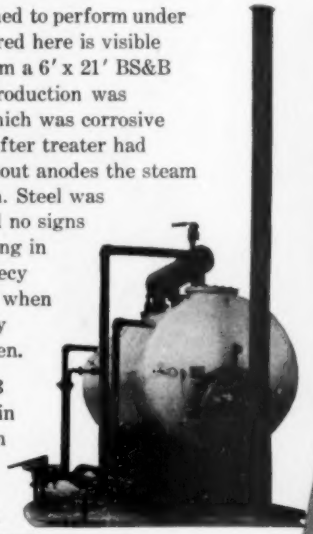
YEARS AHEAD IN DRILL STEM TESTING

BS&B Horizontal Emulsion Treater*

Proven for Successful Treating Where Water is Corrosive

Visible Proof of Steam Chest Efficiency

The BS&B Steam Chest is designed to perform under difficult treating problems. Pictured here is visible proof . . . a steam chest taken from a 6′ x 21′ BS&B Horizontal Emulsion Treater. Production was approximately 10% salt water which was corrosive and high in scaling properties. After treater had been in service for 120 days without anodes the steam chest was removed for inspection. Steel was completely free of rust . . . showed no signs of corrosion. Light deposit showing in picture is nothing more than fleecy salt which settled on steam chest when treater was drained. It was easily wiped clean after picture was taken.



In many areas where the BS&B Horizontal Emulsion Treater is in use, operators are finding its steam chest eliminates firebox burnouts —even where treating problems are tough and water is corrosive. Lower temperature permits minimum heating of salt water — reduces corrosion. Low steam chest skin temperature minimizes chance of salt deposits and eliminates possibility of "coking."

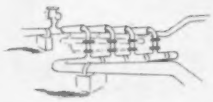
*Patent Pending

Convenient and easy to house for cold climates
Easy to protect dump valves from freezing temperature—easy to hookup—easy to get to—easy to keep clean—and easy to paint. Costly routine inspection of firebox not necessary. BS&B Horizontal Emulsion Treater available for delivery in a size to meet your treating requirements.

EFFICIENCY BS&B RELIABILITY
OUR 60TH YEAR

BLACK, SIVALLS & BRYSON, INC.
Oil and Gas Equipment Division, Dept. 1-A3
2131 Westwood Blvd. Oklahoma City, Oklahoma

at the wells . . .

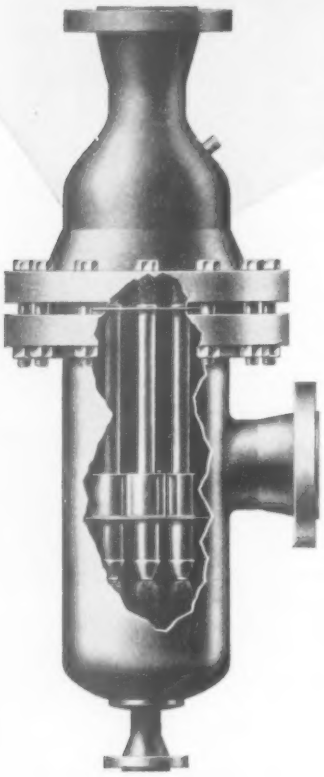


in the pipelines . . .

DRY GAS SCRUBBERS

assure you efficient natural gas cleaning

without liquid filters



Aerotec Dry Gas Scrubbers offer you a highly efficient means of removing dusts and distillates from gas. In the "Big Inch" and many other installations at wells and in pipelines, these units are daily proving the advantages of *dry* scrubbing.

The Aerotec Gas Scrubber uses no oil or other liquid as a filtering medium. This eliminates carryover and other normal disadvantages of conventional type scrubbers. By keeping the gas clean and dry, Aerotec units help prolong the life of compressors and reduce pipeline maintenance.

Aerotec precipitating tubes are the heart of this dry scrubber. Gas passes through these multiple, small-diameter tubes, and the foreign matter is separated from the gas by centrifugal force. Discharge is continuous.

Space-saving compactness, light weight, and piping simplicity of the Aerotec Dry Gas Scrubber permit easy installation. The standard units are available in practically any size up to 100,000,000 SCFD. Manifolding meets needs for larger capacities. Our representative will gladly recommend the Aerotec Scrubbers your specific gas-cleaning problem requires. Call or write today.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.

(Offices in 38 Principal Cities)

Canadian Affiliates: T. C. CHOWN, Ltd., Montreal 25, Quebec; Toronto 3, Ontario

Manufacturers

THE AEROTEC CORPORATION

GREENWICH, CONN.

Lay sour crude pipe with 62% less labor cost

Easy-handling Tenite pipe means substantial installation economies. In a typical case, three men laid 4000 feet of 4" Tenite pipe a day; eight men are usually required to handle the same amount of steel pipe.

Extruded of Eastman cellulose acetate butyrate plastic, Tenite pipe does not corrode under oil-field conditions. Major oil producers are successfully using it for sour crudes, salt water disposal, and in areas where electrolytic action affects steel pipe.

Because of Tenite's extra-smooth walls, paraffin has never clogged a Tenite pipe line. For any given head loss Tenite pipe also delivers approximately 40% more fluid than clean steel pipe of the same diameter.

Pipe extruded of Tenite is made by various companies to which Eastman supplies the plastic compound. Send the coupon for further information about Tenite plastic pipe. If you need assistance in adapting Tenite pipe to your operation, our technical staff will be glad to help.

For corrosion resistance ask for PIPE MADE OF–

TENITE

an Eastman Plastic

• EASTMAN CHEMICAL PRODUCTS, INC.
Sales representative for
TENNESSEE EASTMAN COMPANY
Division of Eastman Kodak Company
KINGSPORT, TENNESSEE

EASTMAN CHEMICAL PRODUCTS, INC.
DEPT. 1, KINGSPORT, TENNESSEE

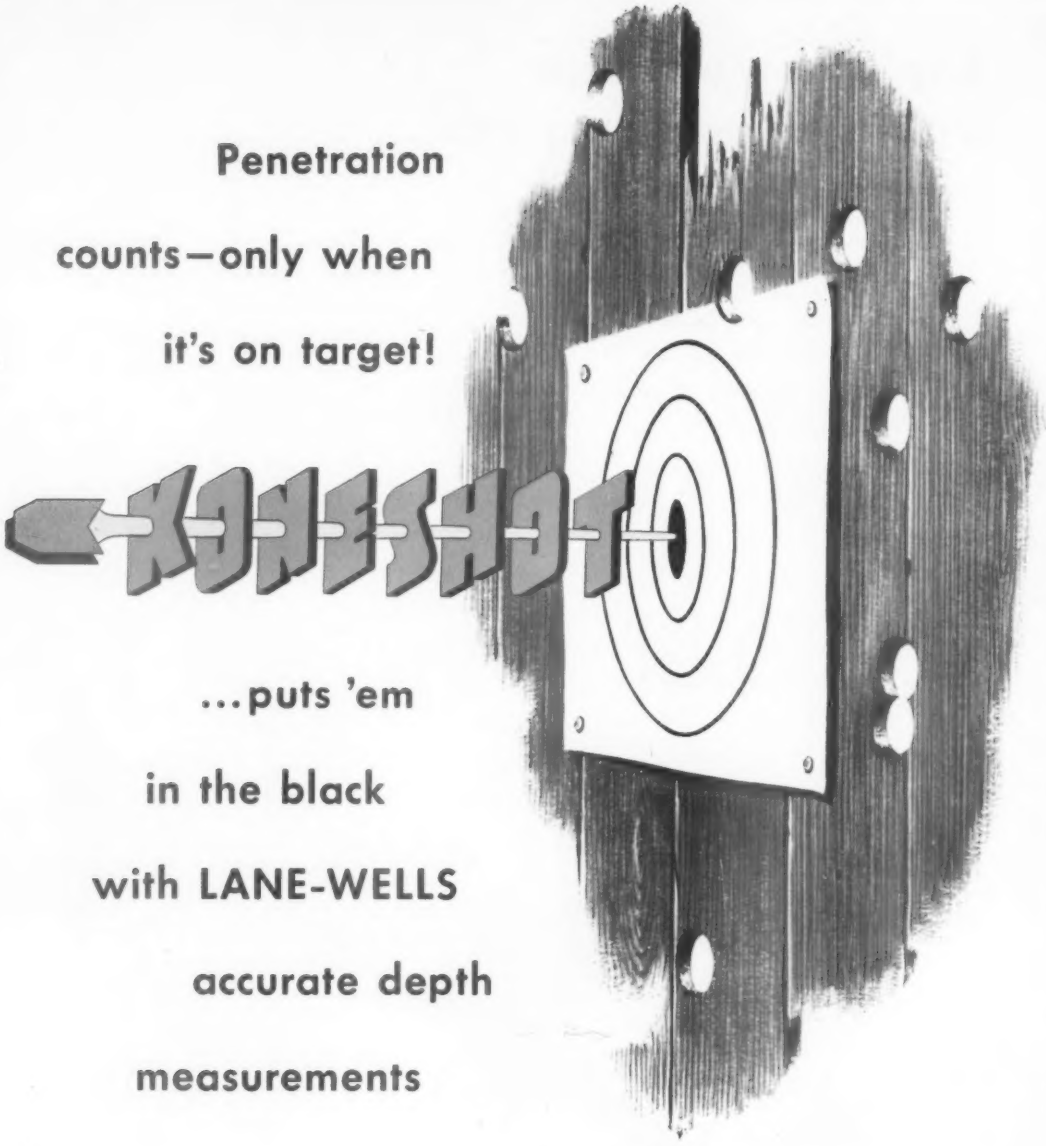
Please send me further information about TENITE PLASTIC PIPE

NAME.....
TITLE.....
COMPANY.....
STREET.....
CITY.....STATE.....

Penetration

counts—only when

it's on target!



...puts 'em

in the black

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measurements

Fast Service From 71 Branches With Thoroughly Experienced Men

Tomorrow's Tools—Today!

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AK-603

Double Your Drying Capacity!

S/V Sovabeads Increase Dehydrator Efficiency Almost 100%

Yes, it's true—*S/V Sovabeads* will almost *double* the efficiency of your dehydrator units—maintain this efficiency at temperatures as high as 120°F.! And look at these other advantages:

S/V Sovabeads provide a longer desiccant bed life. They eliminate caking . . . reduce channeling, dusting and pressure drops. Reactivation is quick, easy and economical.

★ ★ ★

Why wait to improve *your* dehydration operations? Call your Socony-Vacuum Representative today for full information about S/V Sovabeads.

SOCONY-VACUUM
. . . process products

Process Products

SOCONY-VACUUM OIL CO., INC., 26 Broadway, New York 4, N. Y., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

Sure cure for many a headache...

DARLING CAST STEEL PIPE LINE GATE VALVES

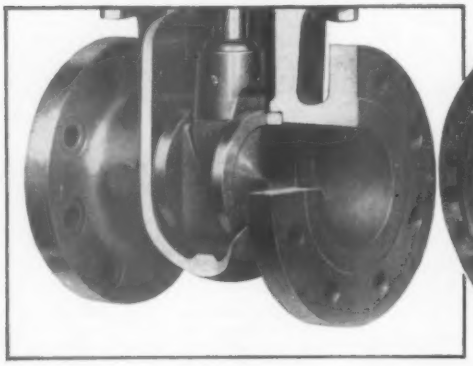
IF you're a believer in "proof of the pudding", you have only to check with Darling users to get facts on how Darling pipe line valves can save you time and money and prevent chronic valve headaches. For one thing, there's Darling's unique *fully revolving, double disc, parallel seat feature* . . . revealed in the cutaway view. It's simplicity itself, but it wins hands down by cinching:

1. Positive, easy, tight closing. **2.** Automatic adjustment for valve body distortion. **3.** Elimination of gate-to-seat galling. **4.** Uniform wear distribution. **5.** Greater service life with less maintenance.

SEND FOR DATA — Space here won't permit a complete explanation of just *why* this feature gives you these and many other important advantages. That's why we suggest that you send for *all* the facts. Darling parallel seat gate valves come in a wide range of sizes and constructions for main line, gathering, manifold, tank farm and all other pipe line services. Outline your particular service needs or ask for complete descriptive bulletin.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario



Darling 22" Series 400 motor-operated cast steel, fully revolving, double disc, parallel seat pipe line gate valve for cold pressures up to 800 lbs. Darling pipe line gate valves have full seat opening, same as I.D. of pipe, allowing free passage of line scrapers.

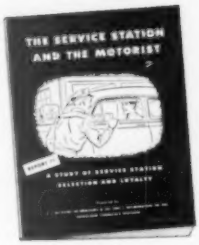
DARLING
VALVES

FOR PLUS VALUES, JOB PROVED AGAIN AND AGAIN

DU PONT
PETROLEUM CHEMICALS DIVISION
NEWS
DU PONT

March ★ One of a Series of Interest to the Petroleum Industry ★ 1953

Consumer Buying Trends Reported In New Booklet



The first report based on the Du Pont survey of service station customer buying habits is now off the press.

It is an authoritative study showing *why* motorists select certain service stations . . . and remain loyal to certain stations. As such, this report will be of considerable value to gasoline marketers in planning sales and promotion programs.

Copies are now being distributed to oil company marketing groups through the Du Pont Petroleum Chemicals Division district offices. Report No. 2 on brand name recognition and loyalty will be ready for distribution late in April.

To Guard Against the Effects of Copper Contamination—an "Insurance Policy"

Even when gasoline leaves the refinery entirely free of copper, it often ends up at the service station or in a customer's car with traces of copper present.

The trouble can generally be traced to the distribution system. All of these systems contain valves, pumps and various fittings which may be potential sources of copper contamination.

Today, consumer interest in gasoline quality is greater than it has been in many years. Your *at-the-pump* quality, therefore, can be an important competitive factor.

COSTS LESS THAN $2 PER 1,000 BARRELS

Refiners can be sure their gasolines are free from the harmful effects of copper contamination with Du Pont Metal Deactivator. The cost is less than $2 per 1,000 barrels.

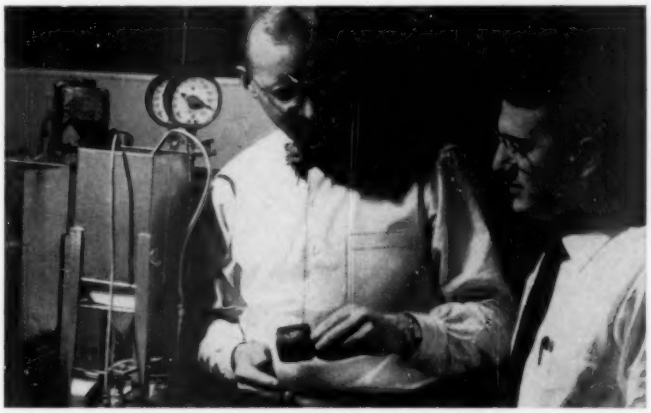
Du Pont Metal Deactivator is specially formulated to offset the effects of copper in gasoline. When copper is present—from any source—the desired stability can generally be obtained more economically with the aid of small amounts of Metal Deactivator rather than with antioxidants alone.

New Fuel Oil Additive Offers Many Advantages

Both dispersing and stabilizing properties combined in new additive developed by DU PONT

Many customer complaints on plugged filters, screens and fuel lines may now be eliminated through the use of a new additive.

Known as *Fuel Oil Additive No. 2*, it was developed by DU PONT as a dispersant and stabilizer for distillate fuel oils.



MANY CUSTOMER COMPLAINTS, caused by such conditions as this clogged oil burner filter screen, can be eliminated with Du Pont Fuel Oil Additive No. 2.

Distillate fuel oils tend to deteriorate during long-term storage. As a result, both soluble and insoluble residues are formed. The soluble residues are not particularly harmful. The insoluble ones, however, cause plugging of lines, screens and filters in the fuel systems of domestic oil burners and diesel engines.

The usual oxidation inhibitors used in gasoline, greases and lube oils have very little stabilizing effect on fuel oils. Although there are several methods of stabilizing distillate oils – such as clay filtration and caustic extraction—many of these oils have proved very difficult or expensive to stabilize.

ELIMINATES MANY COMPLAINTS

The new Du Pont Fuel Oil Additive No. 2 not only retards the formation of insoluble residues; but also reduces the particle size of those insoluble residues that are formed. In this way it practically eliminates the possibility of complaints due to clogging.

This makes it possible for a refiner to blend catalytic cracked stocks with

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED

New Additive

his straight-run product without sacrificing stability in the blend.

SEASONAL FLEXIBILITY

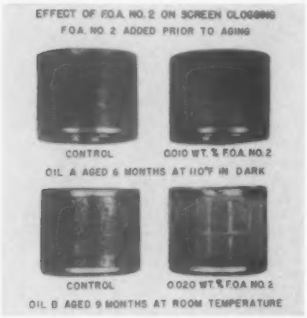
Marketing a blend of straight-run and catalytic cracked fuel oil has several advantages to the refiner such as:

1. Greater flexibility to meet peak seasonal demands.
2. Increased yield of domestic heating oils.
3. Release of straight-run stocks for sale as a premium diesel fuel or for use as charging stock.

Being ashless, Fuel Oil Additive No. 2 is particularly suitable for use in blended fuels for diesel engines.

HIGHLY EFFECTIVE

In all the types of fuels so far tested at the Du Pont Petroleum Laboratory, Fuel Oil Additive No. 2 gives desired results at a low cost because of its extremely high effectiveness.


EFFECT OF F.O.A. NO. 2 ON SCREEN CLOGGING
F.O.A. NO. 2 ADDED PRIOR TO AGING
CONTROL
0.010 WT. % F.O.A. NO. 2
OIL A AGED 6 MONTHS AT 110°F IN DARK
CONTROL
0.020 WT. % F.O.A. NO. 2
OIL B AGED 9 MONTHS AT ROOM TEMPERATURE

THIS PHOTO of four filter screens shows clearly the improvement in two oils to which Du Pont Fuel Oil Additive No. 2 has been added.

This new additive does not affect the color of the product in any way. It can be easily added—either directly from the drum or in a special kerosine solution to decrease viscosity.

SAMPLES AVAILABLE

Refiners who are interested in testing Du Pont Fuel Oil Additive No. 2 should get in touch with their local Du Pont Petroleum Chemicals Division representative for samples and full details.

Heads Central District Laboratory

Twenty years in petroleum research

DR. AUSTIN B. WILDER, laboratory manager in the Du Pont Petroleum Chemicals Division central district, has been engaged in petroleum research work for more than 20 years.

He joined Du Pont in 1947, after 14 years as a research chemist with the Pure Oil Company. Before this he was engaged in fuel research work for the General Motors Research Corporation in Detroit.

Dr. Wilder studied at Berea College. He received his B.S. and M.S. degrees in chemistry at Ohio State University and later received his Ph.D. degree in organic chemistry at the University of Chicago.

DR. AUSTIN B. WILDER

Fellowships to Advance Teaching of Chemistry Awarded by Du Pont

A new program to assist American colleges and universities in the teaching of chemistry will be begun by the Du Pont Company next fall. It provides for new fellowships or grants to 32 institutions during the next academic year.

The program includes two separate plans. Under one plan, grants have been made to 19 private colleges to help them maintain their outstanding performance in training students majoring in chemistry. The other provides postgraduate fellowships at 13 universities to improve the teaching of chemistry to undergraduates.

The need for such assistance was revealed in a comprehensive survey done by the company. Commenting on the new program, Crawford H. Greenewalt, president of the company, said, "The maintenance and encouragement of high-quality teaching is vital to the future supply of scientists and consequently research."

Decisions on detailed use of the funds are being left up to the institutions selected.

MOVIES AVAILABLE

Prints of the following Du Pont films are available to oil companies for training and public relations purposes. They may be borrowed or purchased. Address request to nearest Petroleum Chemicals Division district office.

Pipeline on Wheels—A 26-minute, full-color movie on tank truck safety. Suitable for both training and public relations purposes.

What Makes a Gasoline Good—An 18-minute cartoon movie in color. Presents the story of how high quality gasoline is made in easy-to-understand form. Ideal for dealer training meetings.

In addition to the above, Du Pont makes available a special library of films of particular interest to the petroleum industry.

DU PONT
REG. U.S. PAT. OFF.
Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • Wilmington 98, Delaware

District Offices: New York, N. Y. · Chicago, Ill. · Tulsa, Okla. · Houston, Texas · Los Angeles, Calif.

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A-5053

Printed in U. S. A.

ANOTHER *Electric Power* CASE HISTORY

MORE SERVICE LESS SERVICING WITH...

Electric Power

You'll Get More for Less with *PEP in '53

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY

Our 25th Year

Petroleum Electric Power Association

DALLAS, TEXAS

How ONE can equal SIX

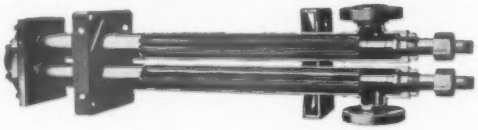
IN FUEL OIL HEATING

Conventional fuel oil heaters have bare tubes, with practically the same amount of surface inside and outside. But fuel oil requires more heat transfer surface than does the heating steam, because of its considerably lower heat transfer rate. Therefore, the number of bare tubes required for the heat-absorbing capacity of the oil is very much greater than the number which would be sufficient for the heat conductivity of the steam.

The G-Fin heat transfer elements of the G-R Twin G-Fin Section compensate for this difference in heat transfer rates of oil and steam. Their longitudinal fins have a total of more than 6 times as much surface as the interior of the elements. This means that a Twin G-Fin Section will have only 1/6 the number of tubes that would be required by a conventional bare tube heater for the same duty.

Investigate these compact, simple units and their many other advantages for heating your fuel oil. Complete information will be sent without obligation.

THE GRISCOM-RUSSELL CO., MASSILLON, OHIO



G-R HEAT TRANSFER APPARATUS *Twin G-Fin Section*

OUT OF THIS WORLD

.. will come more vital oil and gas by using Texas Instruments

There's something new on the Texas horizon ... and on the horizons of the oilfields and prospective oilfields of the world! There's a *new name for an old organization* which has been the manufacturer of seismograph systems, including seismometers, cameras, and portable shot-hole drilling rigs for the worldwide operations of GSI. Many of these products are now available to the industry. At the Houston Show in March, you are invited to see remarkable new electronic developments such as transistors and a completely new integrated timebreak-communication radio system. Make a special note to see the Texas Instruments' booth and shot-hole drilling rig in action at the AAPG, SEPM, SEG Annual Convention in Houston on March 23 to 26.

TEXAS INSTRUMENTS

INCORPORATED

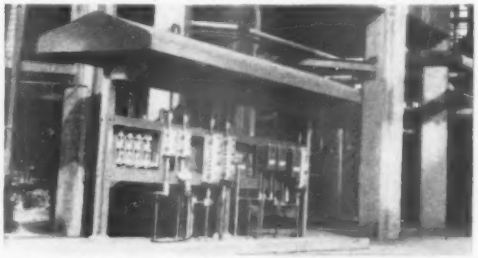
6000 LEMMON AVENUE DALLAS 9, TEXAS

INCOMING POWER is controlled by this G-E metal-clad switchgear. Providing primary-circuit protection, these compact G-E units are factory-assembled to speed installation, metal-enclosed to provide maximum safety to personnel.

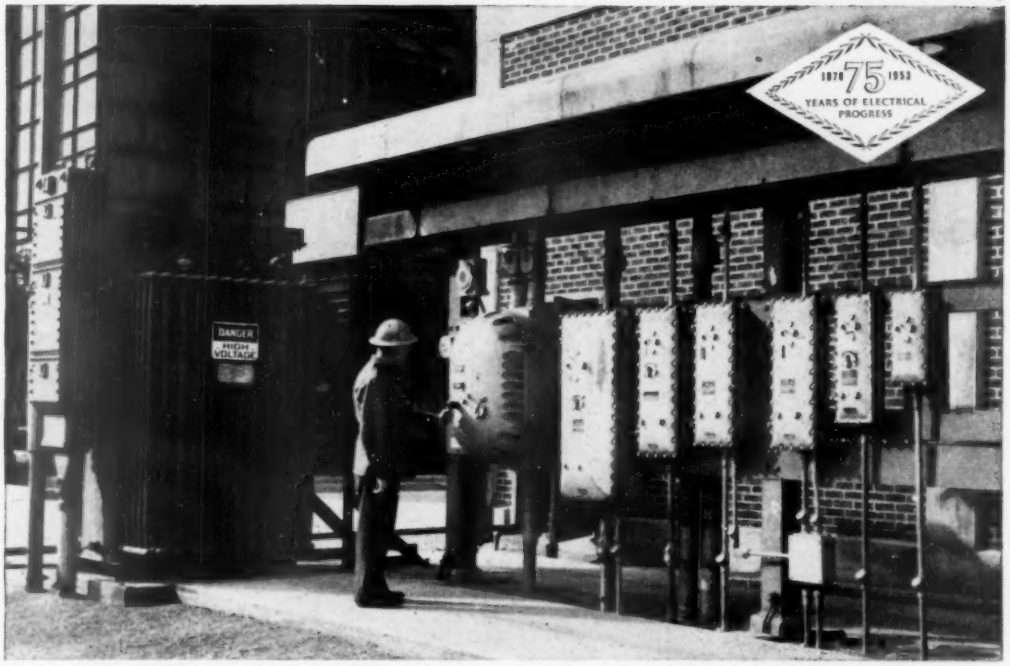
Refinery's power system helps

PLANT POWER FACTOR is improved by 360-kvar G-E capacitor equipment near a refinery-type load-center substation.

COOLING-WATER PUMPS, in non-hazardous location, are driven by four G-E vertical motors rated 150 hp, 440 volts.



IN HAZARDOUS LOCATION near catalytic cracking tower, explosion-proof enclosures help protect G-E motor starters.



HIGH VOLTAGE POWER is brought economically to load centers and stepped down at unit substations like this one, rated 1000 kva.

Racked-up G-E explosion-proof equipment includes manually operated master breaker and magnetic starters for plant motors.

maintain high-output continuity

G-E ENGINEERING uses modern facilities in designing improved equipment to give you greater continuity of power service. These engineers at the new G-E Switchgear Development Laboratory examine films of a typical switchgear test.

G-E engineered distribution system helps keep Phillips Petroleum Co., Phillips, Texas plant refining 80,000 bbl/day

In its refinery at Phillips near Borger, Texas, the Phillips Petroleum Company cracks and blends petroleum products at the rate of 80,000 barrels per day. Helping to maintain this output on a continuous basis is the plant's power distribution and drive equipment, co-ordinated by Phillips' and General Electric engineers to meet the plant's specific processing needs.

Here is one more in a long list of petroleum refineries that have profited by G-E engineering experience. Whatever *your* refinery's electrical needs, General Electric application engineers can help you or your consultants co-ordinate your electric equipment for maximum efficiency. For more information, contact your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 661-37

Engineered Electrical Systems for Petroleum Refineries

GENERAL ELECTRIC

THE MOST IMPORTANT

CASE HISTORY *is your own!*

In nearly a half century of dehydrating effort, the Tretolite Company has compiled thousands of successful case histories. While such case histories provide an impressive record of succssful Tretolite applications, they also have shown that very few demulsifying problems are similar. Chemical formulas, methods of application, and dehydrating results, vary from state to state, field to field, and frequently, lease to lease. One important fact that the Tretolite Company has learned, is that virtually every dehydrating problem must be considered as an individual case.

That is why the Tretolite Company insists on having field engineers in every oil production area. They are there to get you the chemical formula and method of application which will be most effective for *your problem*. The Tretolite Company believes that the "case history" which is of greatest interest to *you*, is the one written on *your* lease. *After all, that's the one that solves your problem and saves your money.*

On your next dehydrating problem, call in your Tretolite field service engineer. He's an expert at producing *successful* case histories.

TRETOLITE COMPANY

Chemicals and Services for the Petroleum Industry

SAINT LOUIS 19, MISSOURI • LOS ANGELES 22, CALIFORNIA

DEHYDRATING • DESALTING • CORROSION INHIBITING

SCALE PREVENTING • PARAFFIN REMOVING • WATER DE-OILING

T 53-3

You Spent at least $6,000 to create his job... will you spend $2.30 to Protect it?

Eye Accidents Cost $176,000,000 a year in LOST MAN-HOURS alone*

To give a skilled worker the tools and machines to produce, industry invests $6,000 or more per job. If you lose his skill due to an industrial eye accident, you tie up your $6,000 completely if he has no adequate substitute. You lose the production his tools turn out. And if his is a critical "bottleneck" operation, you may tie up entire plant output.

Even a production *slowdown* is grim business in these days of high break even points. Why risk it because of a costly eye accident, when the average cost of a pair of safety goggles that can prevent his eye accident is only $2.30? Call your nearest AO Branch Office and learn how an AO Eye Protection Program can save money well into four figures annually.

*Estimate. Industrial eye injuries cost over $5 per employed worker per year—with compensation averaging nearly $400 per injured man.

American Optical COMPANY
SAFETY PRODUCTS DIVISION

Write American Optical Company, 543 Vision Park, for free booklet "Improved Industrial Vision" telling how AO's Industrial Vision Program cuts costs, increases production, decreases accidents.

SOUTHBRIDGE, MASSACHUSETTS

BRANCHES IN PRINCIPAL CITIES

Back of WOLVERINE PLAIN CONDENSER TUBES

s a long history of producing tube—nothing but quality-controlled tube, if you please.

You can eliminate many tube failures by specifying Wolverine for your next retubing job or in your original installation.

Available in most popular sizes and a wide range of alloys

Where highest efficiency must be crowded in smallest space —

CONSIDER

WOLVERINE TRUFIN*

—the integral finned tube

that will withstand vibration and extreme temperature changes. Available in wide range of sizes, fin spacings and heights.

*REG. U. S. PAT. OFF.
A PATENTED PROCESS RE. 22465

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ontario.

WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.
Manufacturers of Tubing Exclusively
1459 CENTRAL AVENUE • DETROIT 9, MICHIGAN
ESTABLISHED 1916
Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*

Export Department, 13 E. 40th St., New York 16, N. Y.

. . . and Back of WOLVERINE ELECTRIC WELDED STEEL TUBES

. . . is a history of more than 36 years of concentrated experience in making tube—not just ordinary tube, but tube of most dependable quality.

In entering this new field of electric welded steel tube production, we are drawing on all the best skills and techniques that have proved successful and won for Wolverine the high reputation it enjoys in the copper tube production—and you can accept the new Wolverine Welded Steel Tube with absolute confidence.

As a part of your condensers, heat exchangers or boilers, this quality tube will prove a valuable factor in making your equipment operate at top efficiency.

Wolverine engineers will help you select the right tube for your particular need.

Available

in Sizes . . .

¼" to 3" O.D.

in Analyses . . .

SAE 1010 SAE 1015 SAE 1020
SAE 1025 SAE 1030

ESTABLISHED 1916

WOLVERINE TUBE DIVISION

of CALUMET & HECLA, INC.

Manufacturers of Tubing Exclusively

1459 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*

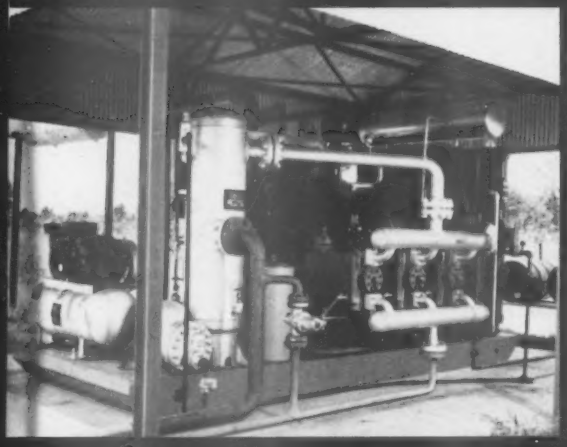
Export Department, 13 E. 40th St., New York 16, N. Y.

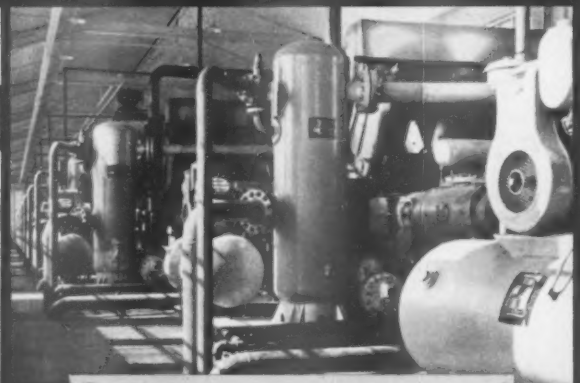
BEAIRD Ingersoll-Rand

Packaged Compressor Plants

1 or 11

They Cost Less to Install —Cost Less to Operate





▲ A single 165 H.P. 6JVG packaged compressor plant used for gas boosting in the Carthage Field, Texas.

A bank of nine 440 H.P. and two 330 H.P. packaged compressor plants used for pipeline boosting in Pennsylvania. ▶

FOR USE IN:

Gas Lift
Field Gas Gathering
Flare Gas Collections
Repressuring

MACHINING
FABRICATING
STEEL WAREHOUSE

SINCE 1916
BEAIRD
SHREVEPORT

LOWEST COST PER HORSEPOWER, INSTALLED

Whether you need a single small compressor or a bank of large units, Beaird-Ingersoll-Rand packaged compressor plants *cut installation costs — cut operation costs.* For the same economies of packaging which have made single Beaird units lowest in cost per horsepower, also apply to large installations using many Beaird packaged plants. And multi-unit installations as well as single units have automatic controls which permit them to operate continuously without the expense of a regular attendant.

Let us show you how you can save on both installation and operation costs by using Beaird-Ingersoll-Rand packaged compressor plants.

THE J. B. BEAIRD COMPANY, INC.
SHREVEPORT, LOUISIANA

CAST STEEL FITTINGS

ANHYDROUS AMMONIA EQUIPMENT

PRESSURE BULK STORAGE

LP GAS SYSTEMS

DEPENDABLE...because they're ENGINEERED FOR OIL-WELL PUMPING

Reliance Totally-enclosed Fan-cooled A-c. Motor. All other standard enclosures available, with wide choice of mechanical designs and special mountings. Ratings from ¼ to 300 hp.

Rugged Reliance A-c. Motors are proving that "All Motors Are NOT Alike" on grueling oil-well pumping jobs in all types of climate and location, 24 hours a day, despite extremes of temperature, dust, fumes and moisture. Heavy shafts, bearing to bearing—indestructible pressure-cast aluminum rotors—shock-resistant frame and bearing-bracket construction—man-sized conduit boxes—pressure-welded core laminations—and tough Reli-X insulation are among the many features that make these motors the most dependable, most economical that you can buy for oil-field service.

To see for yourself why these better motors will perform better on *your* pumping job, call an Application Engineer at the Reliance Sales Office nearest you.

B-1481

WHY THE RELIANCE PRE-LUBRICATED BEARING DESIGN IS BEST

The Reliance pre-lubricated bearing provides *four times more operating hours without re-lubrication* than any other bearing used in motors today. And—whatever your lubrication schedule—*you just can't grease 'em wrong!* To get the complete "inside story" on motor bearings, write today for Bulletin B-2201. It contains hard facts on the advantages of the Reliance pre-lubricated bearing design, with cutaway view, cross-section diagram, comparison chart, and statements by bearing manufacturers.

RELIANCE ELECTRIC AND ENGINEERING CO.

1120 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities

Check list for maximum efficiency of horizontal separators...

...and only PARKERSBURG SINGLE TUBE HORIZONTAL SEPARATORS have them all!

GAS FLOW in the Parkersburg single tube design is about 20% slower than in comparable two-tube separators. More effective natural separation is the result.

LIQUID LEVEL is controlled to precise limits by Parkersburg's exclusive No-Bleed Liquid Level Controller. Non-freezing, non-plugging, it is adjustable to hairline accuracy and hair trigger action.

RETENTION TIME is longer because it retains a greater volume of oil at any rate of flow and allows more time for the oil to give up its gas.

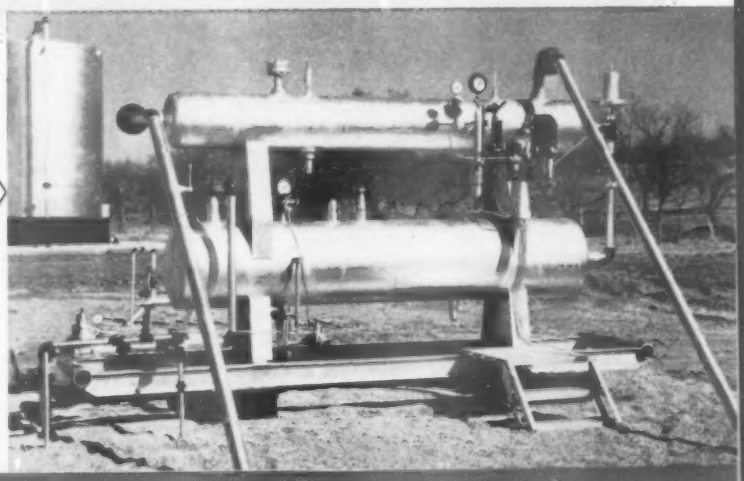
FREEZING TROUBLE is greatly minimized because liquid is in contact with, and warmed by, the full stream of gas. Liquid is always 15 to 20 degrees warmer.*

INTERFACE AREA is 20% greater. Degassing is more thorough and complete . . . foam dissipates more rapidly.

CLEANING is easier. There is only one tube to clean and it is open all along the bottom. The single tube has three drains instead of one.

ASK YOUR PARKERSBURG REPRESENTATIVE about other advantages that make the Parkersburg ***Single Tube*** Horizontal Separator a far better buy than comparably priced two-tube designs of equal nominal rating.

*Facts based on field service and tests in comparison with two-tube and liquid pot design horizontal separators.



Two Parkersburg Single Tube Horizontal Separators mounted in tandem for dual separation. Either vessel can be used independently of the other if, and when, desirable.

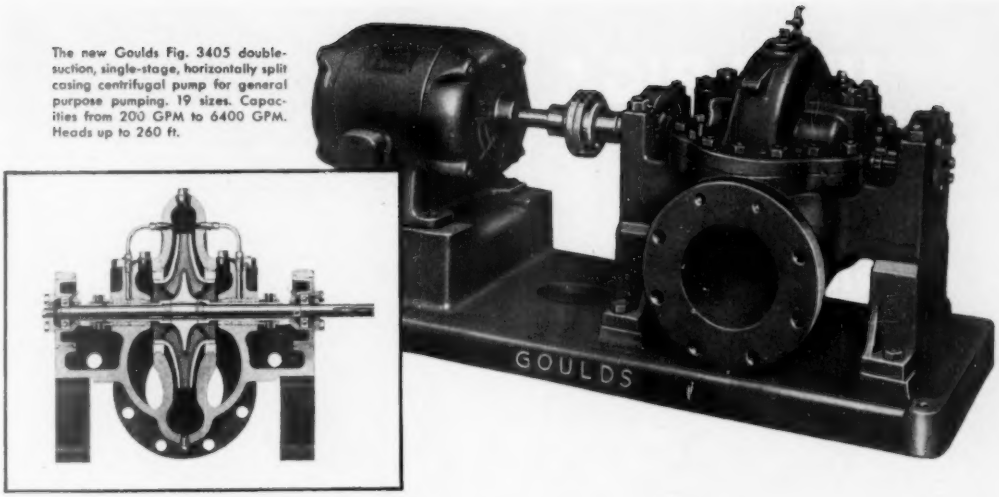
THE PARKERSBURG RIG & REEL COMPANY
Parkersburg, West Va.

NO. 5301

PARKERSBURG
PRESSURE EQUIPMENT

HORIZONTAL AND VERTICAL SEPARATORS • HYRECO • HYDRACEPTER • SCRUBBERS • TREATERS • HEATERS
Manufactured in Houston, Texas

The new Goulds Fig. 3405 double-suction, single-stage, horizontally split casing centrifugal pump for general purpose pumping. 19 sizes. Capacities from 200 GPM to 6400 GPM. Heads up to 260 ft.



This new pump gives you 5 big cost advantages

The price you pay is only one element of the cost of a pump installation.

Good engineering practice also figures in the cost of pump breakdowns, low operating efficiency, changeovers to meet new conditions, replacement parts inventories, even the floor space the installation takes up.

Here's why the new Goulds centrifugal pump is designed to improve your cost experience in every one of those elements.

1. ***It combines seven design features that mean maximum operating efficiency and minimum maintenance.***

Every one of these construction features is standard with this new design. Together they offer you, without extra cost, a quality of service that's unique in its approach to general liquid handling.

a. Renewable stuffing box bushings.
b. Bearing housings sealed against moisture and dirt.
c. Cowl-type glands suitable for use with quenching liquids.
d. Stainless steel impeller keys.
e. Teflon water seal rings.
f. Die-formed stuffing box packing.
g. Corrosion resistant gland bolts.

2. ***Interchangeability of parts.***

With only three shaft and rotating parts assemblies to provide for 19 pump sizes and 38 pump combinations, this new design offers you a remarkable range of interchangeable parts. A glance at the interchangeability chart on page 7 of the descriptive bulletin will show you:

a. how this design gives you great flexibility in making field changes should your pumping requirements change;
b. why the first cost of this unit is so low due to standardization in manufacture; and
c. how this interchangeability helps to reduce spare parts inventories.

3. ***Compact construction.***

You will be particularly pleased with the short over-all length of this new design. Short bearing spans cut lengths as much as 50%. This means a real saving in floor space.

4. ***Flexibility of stuffing box.***

You can use either conventional stuffing boxes or mechanical seals depending on requirements. And you can change from one to the other in the field if need be.

5. ***Easy rotation change.***

A unique device, locking shaft sleeves, permits you to change from right-hand rotation to left-hand rotation or vice versa in the field without construction changes.

More than 50 years of experience in meeting industry's needs for general purpose centrifugal pumps come to a climax in this design.

GET FULL DETAILS This 12-page illustrated bulletin, No. 721.6, covers the complete details of the new Goulds Fig. 3405, including specifications, interchangeability tables and performance curves. Be sure you have the whole cost-advantage story before you select another general purpose pump. Contact your nearest Goulds representative or mail the coupon below today.

Goulds PUMPS INC. Seneca Falls New York

GOULDS PUMPS, INC., Dept. OG, Seneca Falls, N.Y.

Please send me Bulletin No. 721.6 describing the new Fig. 3405 centrifugal pump.

Name_____

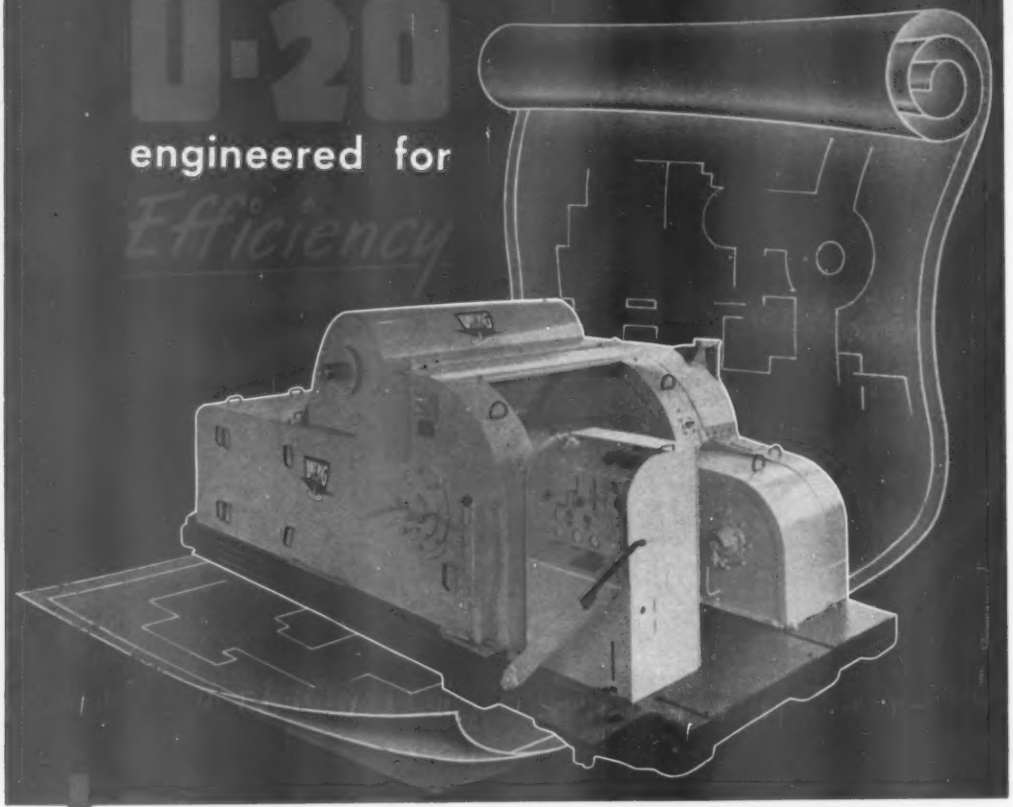
Company_____

Address_____

City_____ State_____

UNIT RIG'S U-20

engineered for *Efficiency*



Designed to offer the maximum in efficiency, the Model U-20 features:

COMPACTNESS — for ease of transportation. SPEED — for faster drilling. RUGGEDNESS — for longer life. ECONOMY — of operation for 7000 to 12000 ft. drilling. CONTROLS — planned for convenience of the driller. MINIMUM RIG UP TIME — with single package drawworks and transmission.

Buy Efficiency - - - Buy The Best - - - Buy The U-20

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TULSA, OKLAHOMA U.S.A.

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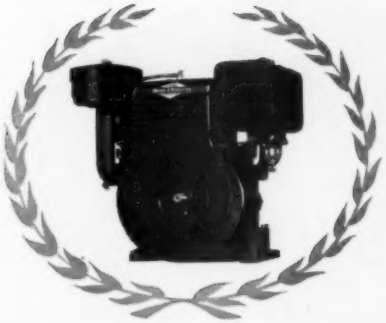
UR-523



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built in ONE year

It's a new world production record — never before accomplished. For 33 years BRIGGS & STRATTON has been establishing a long list of firsts. And now, in 1952, another is added.

BRIGGS & STRATTON is recognized as the pioneer and the leader in its field . . . setting new standards, year after year in engineering, in design, in engine performance and in precision mass production.

Whether you are a manufacturer, dealer or user of gasoline engine powered equipment — you are assured of top performance when you specify BRIGGS & STRATTON 4-cycle, single cylinder, air-cooled engines. They are the "preferred power" value all over the world.

BRIGGS & STRATTON CORPORATION
Milwaukee 1, Wisconsin, U.S.A.

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

BRIGGS & STRATTON 4-cycle, single cylinder, air-cooled engines are available from 3/4 to 8 1/4 hp. — in many models and types. They are preferred power for hundreds of types of machines, tools and appliances. All are backed by a world-wide service organization, factory supervised, unequalled in the industry.

In the automotive field, too, Briggs & Stratton is the recognized leader — and the world's largest producer of locks, keys, and related equipment.

Oil helps him haul a priceless cargo . . .

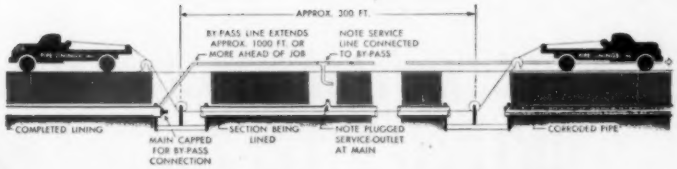
The most priceless cargo of all – human beings. He carries your kids to school . . . your wife to the village to shop . . . GIs homeward bound. He and others like him deliver over eight billion folks a year – on time, comfortably, safely. Oil helps him to do this job. Over 5000 bus companies operate today in our free economy. The result: the best bus service in the world. The Texas Company takes pride in its leadership in supplying this vital field of transportation.

The Texas Company

TEXACO

this ***is an Indian peace pipe...***

The American Indian knew the pleasures to be obtained from smoking long before the European world. He fashioned his crude pipe stem from cane, reed or bone and the bowl from stone, clay or hard wood. But contemporary Indian fighters who tried smoking the peace pipe reported it took a lot of lung power to draw through the rough stems. Compared to our modern pipe, smoking was hard work... and not the pleasant, "easy-draw" smoking pipe smokers enjoy today.


APPROX. 300 FT.
BY-PASS LINE EXTENDS APPROX. 1000 FT. OR MORE AHEAD OF JOB
NOTE SERVICE LINE CONNECTED TO BY-PASS
COMPLETED LINING
MAIN CAPPED FOR BY-PASS CONNECTION
SECTION BEING LINED
NOTE PLUGGED SERVICE OUTLET AT MAIN
CORRODED PIPE

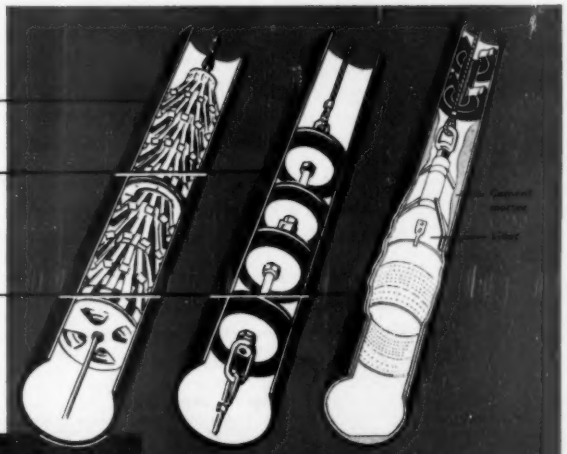
this ***is a pipe lining operation...***

...applicable to water, oil or gas pipe lines...using the Tate Process to renew old iron and steel pipe "*in place*," up to 16" dia., with only temporary interruption of service while by-pass sections are installed.

this *is the steel scraper*... pulled through the pipe to dislodge all tubercles and incrustation.

this *is the rubber swabber*...drawn through the pipe after the scraping operation to make sure pipe is clean and smooth and all loosened material is removed.

this *is the Tate Process liner*... it squeezes cement mortar inside onto the pipe walls, making a smooth, continuous water proof lining of correct thickness for free, fast flow.



When your underground pipe line looks like this

The Tate Process makes it look like this!

CEMENT MORTAR LINING GIVES YOU

- New pipe performance!
- Restores flow coefficients!
- Reduces pumping and maintenance costs!
- Prevents leakage!
- Protects against corrosion, contamination and discoloration!
- At much less than the cost of installing new pipe!

Pipe Linings, Inc. offers "in place" Tate Process lining service for pipe 4" to 16" and "in place" Centrifuge Process lining service for pipe 16" to 144". Expert, trained crews. Complete mobile equipment and facilities.

A Pipe Linings hydraulic engineer will be glad to help you. No obligation!

Write today for details on handy coupon.

PIPE LININGS, Inc., 4675 Firestone Blvd., South Gate, California

( ) Please send complete information on how to obtain new pipe line performance from our old pipe.

( ) Please have one of your hydraulic engineers see me.

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Title_____

Company_____

Address_____

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PIPE LININGS, Inc.

4675 Firestone Blvd., South Gate, California

(A subsidiary of American Pipe and Construction Co.)

If you *operate in the Central South and Southwest—*

Look to this vital link for

WELDED STEEL TUBING SUPPLY!

Whether you have a mechanical . . . heat exchanger . . . condenser tube . . . or boiler tube application—you can be confident of uniform quality when you specify Metal Goods Corporation as your source of supply for *Welded Steel Tubing.* The name, *Standard Tube Company,* which we represent and whose stock we warehouse, is in itself, your guarantee of economic fabrication and lasting service.

All Standard Tubing meets standard specifications—and is available in a complete range of sizes up to 5½" O.D. Special sizes, shapes, finishes, and alloys can be furnished upon request.

If structural strength, ease of fabrication, freedom from corrosion, or heat resistance represents a factor in your manufacturing or installation operations—or if appearance is of importance to your product, then direct your call to us!

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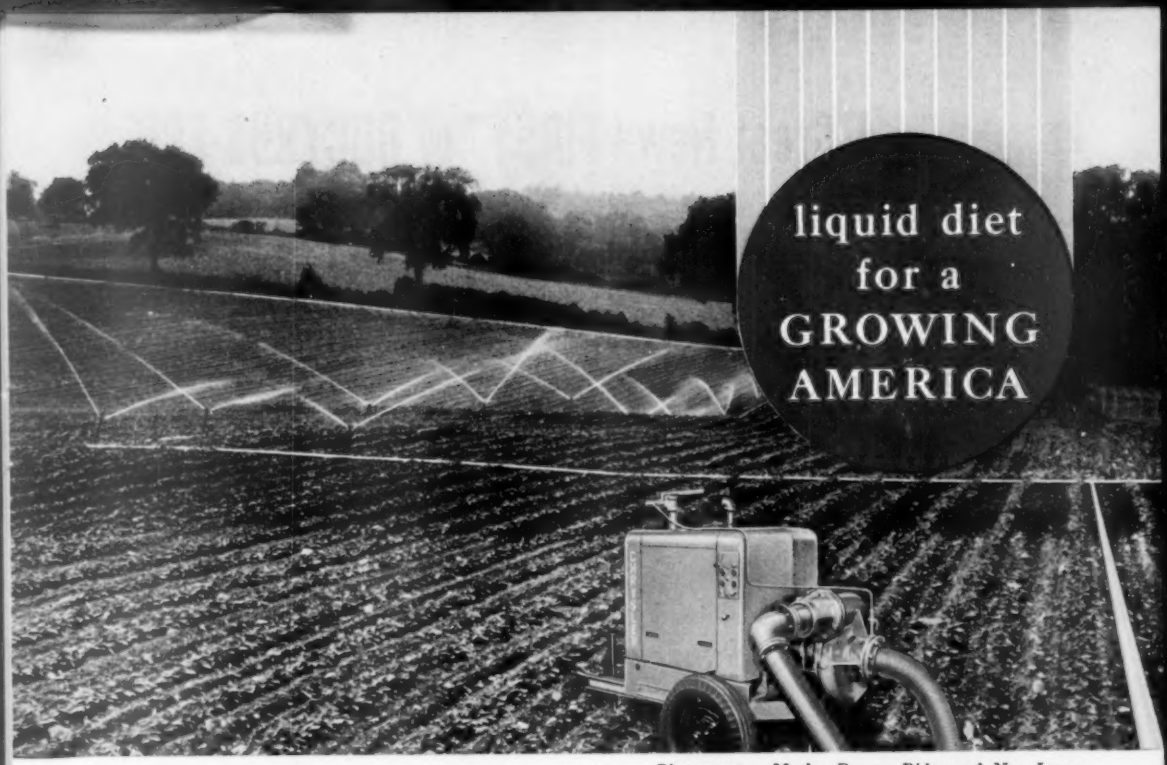


Photo courtesy Marlow Pumps, Ridgewood, New Jersey

nearly 25% more water with Chrysler Industrial Power

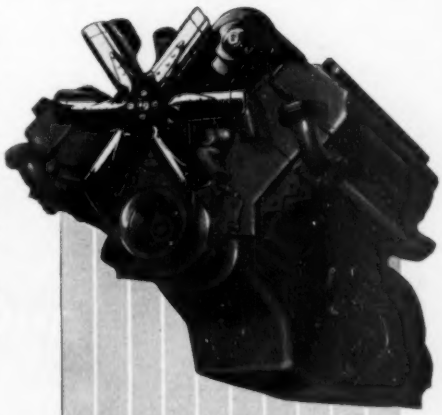
Too seldom does Mother Nature supply moisture in the right proportion for maximum realization of the good things of the soil. This problem is not confined to the so-called "dry" or "arid" regions of the country. For instance, here's a field of beans in upper New York State. This farmer, like many other farmers and growers, has found that a sprinkler system fed by a Chrysler-powered pump provides the supplemental irrigation necessary for best growth.

The Marlow Pump in use here is designed for high capacity pumping. For that reason, the powerful new 180 horsepower, 331 cubic inch displacement Model 20 Chrysler V-8 Industrial Engine was selected to power it. Result: nearly twenty-five percent more water than delivered by pumps powered by engines of similar weight and displacement, *without* sacrificing fuel economy.

This is another fine example of how Chrysler meets the many and varied requirements for industrial power. For instance, Chrysler can equip any of its engines with a corrosion-resistant or fungus-treated electrical system; propane or natural gas burning carburetor; 3, 4 or 5 speed transmission; standard or gýrol Fluid Drive.

Chrysler Industrial Power is not expensive. Production-line methods adapted to specialized industrial engine building provide a custom-built engine at mass-production prices.

For your power needs, see a Chrysler Industrial Engine dealer or write us direct: ***Department 153, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.***



CHRYSLER

Industrial Engines

HORSEPOWER WITH A PEDIGREE

Again... A Great New "FIRST" by BUCYRUS-ERIE

HERE'S an important addition to the long list of significant Bucyrus-Erie "firsts" in spudder design — a heavy duty tripod type derrick for the 48-L spudder. This is the *first* 150-ton derrick of this type designed especially for a spudder. Among its important features are:

1. Ample Height for handling long strings of casing up to 300,000 lbs. in weight. Derrick, completely raised, is 70′4″ high.

2. Simple Design. Derrick assembly consists of five sections — upper, main front, lower, two rear lower triangular legs, and special base — plus gin pole which is used in erection.

3. Crown Block, located top of upper derrick section, is separate unit, supports six casing line sheaves.

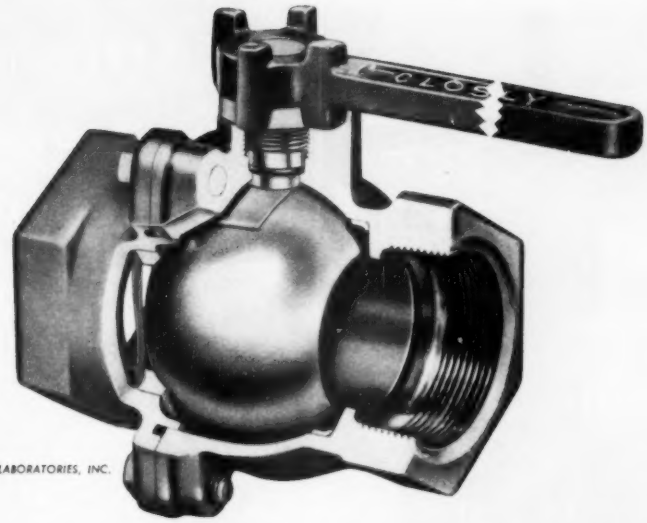
4. Ease of Field Erection. Five derrick sections are assembled on the ground, and derrick legs hinged to base. With gin pole in place, derrick is raised to vertical position, using bull reel drum for hoisting. When derrick is completely raised, gin pole is removed and main front lower section attached — you're ready to drill. Knock-down of derrick is just as simple as erection.

5. Fast Job-to-Job Moves. Moving derrick between locations is simplified by its design. Derrick can be disassembled and moved as five separate units.

This new type derrick and base is available for 48-L's already in the field, or it may be ordered with a new machine in place of the standard derrick. We will be happy to give you full details. Write today! 4553C

South Milwaukee, Wis.

First with the *Finest* in Spudders



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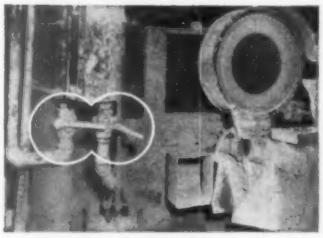
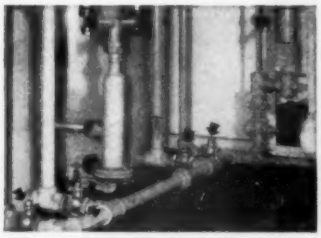
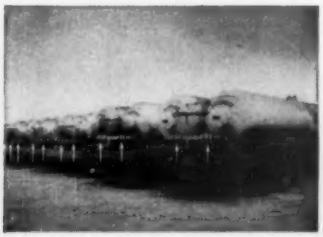
FOR LONG LIFE . . . FOR ECONOMY . . . FOR SAFETY



Leading glass manufacturer reports Rockwood Ball Valves, operated 1500 times a day in a mixing process, were *only valves to stay in service over a year.*



Maintenance engineer of large gas company says: "Easy operation and no maintenance cost make Rockwood Ball Valves *far ahead of any others we have used.*"



On Texas transport firm's fleet of propane-butane trucks, the leakproof construction of Rockwood Ball Valves make them *safest for handling inflammable gases.*

Here's why Rockwood Ball Valves give you more of what you want in valve performance:

FULL ROUND FLOW . . . no change in shape or volume of the fluid stream . . . no turbulence . . . minimum friction loss.

QUICK OPENING AND CLOSING . . . needs only a quarter turn, even under full pressure.

RESISTS WEAR LONGER . . . scratching, pitting and abrasion have little effect on the chrome-plated, floating bronze ball.

STAYS LEAKPROOF . . . in closed position, pressure of fluid automatically positions ball against synthetic rubber seat to form a tight seal.

It will pay you to investigate how these advantages can benefit your own applications. Send for bulletin. Rockwood Sprinkler Company, 104 Harlow Street, Worcester 5, Mass. Distributors in all principal cities.

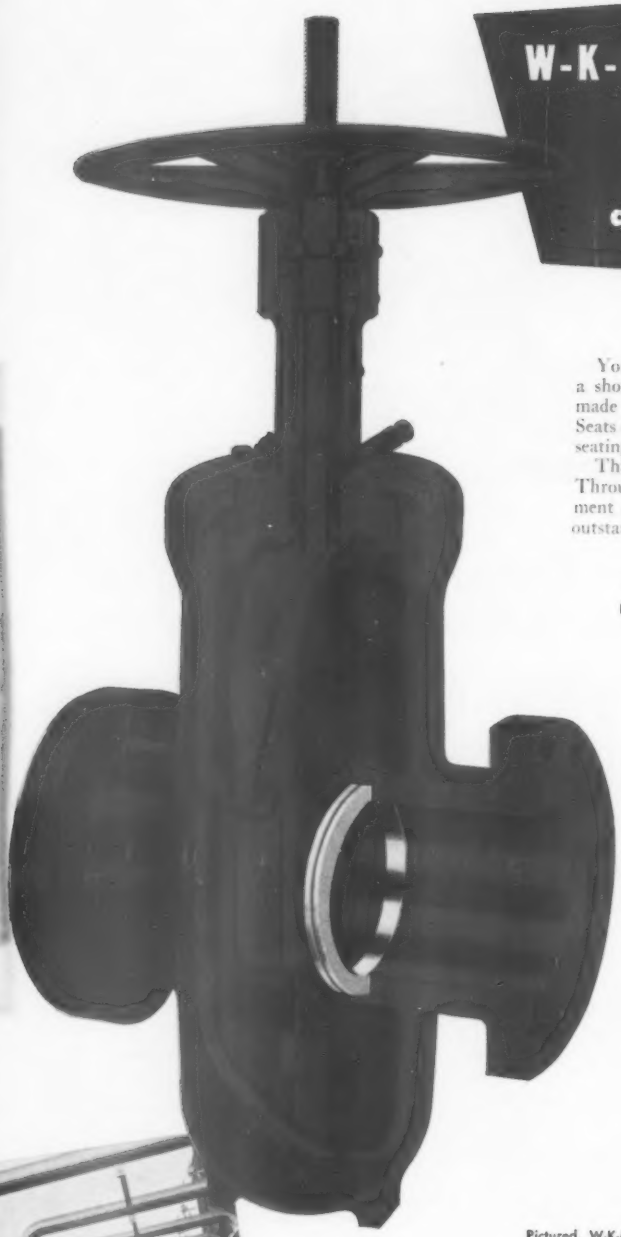
Some Prominent Users

Libby-Owens-Ford Glass Co.
Revere Copper & Brass, Inc.
Bird Machine Co.
Remington Rand, Inc.
Hub Machine Co.
Daggett Chocolate Co.
Also approved by Und. Lab. for L. P. G.

ROCKWOOD *FULL-FLOW* BALL VALVES

THE FLOW IS AS ROUND AS THE PIPE ITSELF

W-K-M RENEWABLE SEATS for ECONOMY and EFFICIENCY



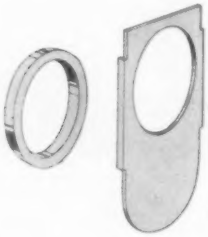
You save money with W-K-M Valves because in just a short time these seats can be replaced and the valve made as good as new, **while the valve is in the line.** Seats are protected in either open or closed position. Large seating area assures longer wear.

This feature and the well-known W-K-M design of Through Conduit Flow, with expanding gate and segment and positive Leverlock, have made W-K-M Valves outstanding throughout the world.

W-K-M COMPANY

P. O. Box 2117 Houston 1, Texas
727 W. Seventh St., Los Angeles, Calif.
Export Office:
30 Rockefeller Plaza, New York, N. Y.

Shown here are W-K-M renewable seats with full-length skirts. Seats are made of various materials to suit any service.



W-K-M Valves

Pictured, W-K-M Valves in service throughout the world.

MARSH

. . . the gauge with the "Recalibrator"

Any pressure gauge can be knocked out of adjustment, but when it's a Marsh Gauge you can quickly correct it with the twist of the "Recalibrator" screw.

This is not only the handiest way to correct a gauge; it is also the best way. Conventional methods of adjustment simply compensate for the error. The "Recalibrator" corrects the relationship between the movement and the bourdon tube—actually *does re-calibrate* the gauge.

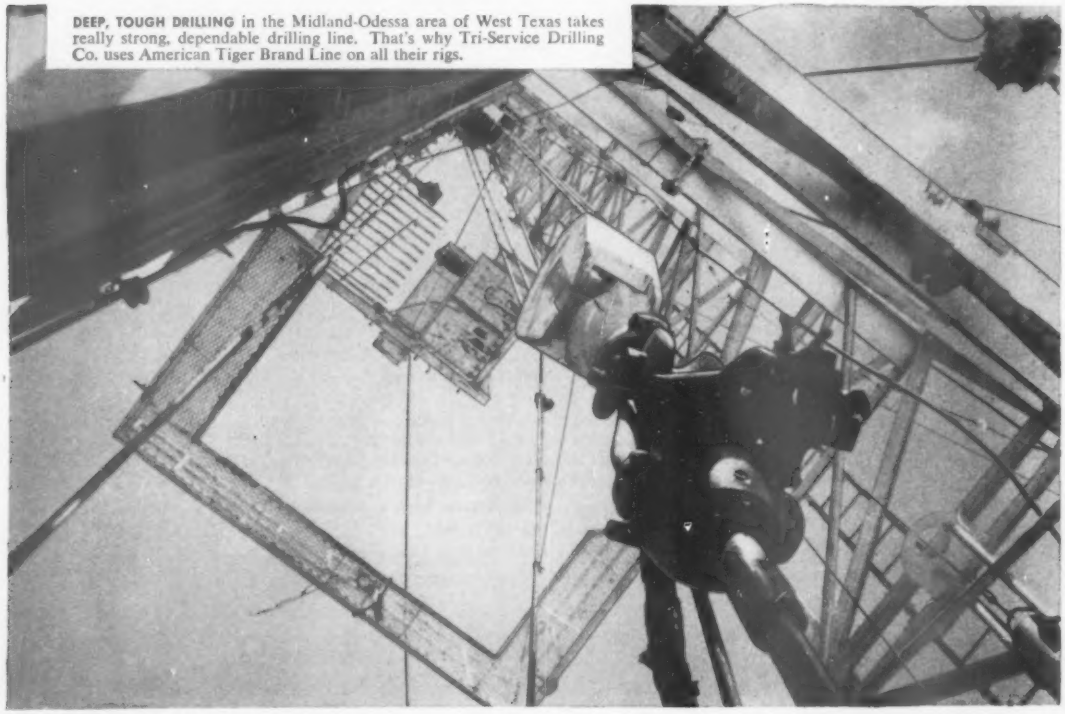
MARSH INSTRUMENT CO. Affiliate of James P. Marsh Corp. Dept. L. SKOKIE, ILL.

Export Dept.: 155 E. 44th St., New York 17, N. Y.

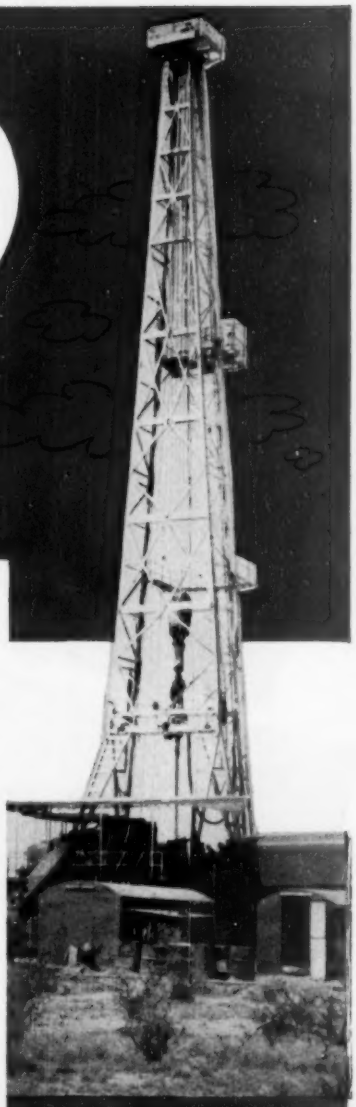
The Marsh line includes gauges especially designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers and other applications including oxygen and welding gauges. Ask on your letterhead for new catalog just off the press.

PRENTISS HIGHTOWER, Driller on Rig. No. 5, says, "We've drilled 49,700 feet of well with this one length of American Line, and it's still in good shape. We like American Lines because we can depend on them and they give us long service."

DEEP, TOUGH DRILLING in the Midland-Odessa area of West Texas takes really strong, dependable drilling line. That's why Tri-Service Drilling Co. uses American Tiger Brand Line on all their rigs.



American Wire Lines give us longer service and less trouble"



MR. M. W. BRANNON, president of Tri-Service Drilling Co., tells us: "We experimented with various brands of line, and found that American Tiger Brand Lines give us the best service. That's why we use American Lines on all of our wells . . . when we find something good, we stick with it!"

Tri-Service Drilling Co. operates five rotary rigs and one cable tool rig in the Midland-Odessa area of West Texas. The rotary rigs are equipped with 1⅛" and 1¼" Tiger Brand Rotary Lines with Independent Wire Rope Cores. The cable tool rig has Tiger Brand Cable Tool Line.

Rig No. 5, an "OILWELL" No. 76, has drilled 7 wells totaling 49,700 feet of extremely tough drilling with just one length of American Tiger Brand 1¼" Rotary Drilling Line. This line is still in use and giving good service.

American Wire Lines come in many types to suit every drilling need. In addition to Rotary and Cable Tool Drilling Lines, there are American Sand Lines, Torpedo Lines, Winch Lines, Hoisting Ropes, and Steel Guy Strand. So next time you buy line, call the American Wire Rope Distributor in your area—he has got *just the line you need.*

USS AMERICAN TIGER BRAND WIRE ROPE UNITED STATES STEEL

USS

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excelsior Preformed

UNITED STATES STEEL

Vogt

WELDED PRESSURE VESSELS

Top quality power and process plant equipment for safe operation at high or low pressures and temperatures is produced here for leading Petroleum Refineries, Chemical Plants, and Power Plants the world around.

A growing preference for Vogt welded pressure vessels is due to skilled personnel, powerful X-ray apparatus to control weld quality and modern stress relieving furnaces, combined with complete laboratory facilities for tests of welds.

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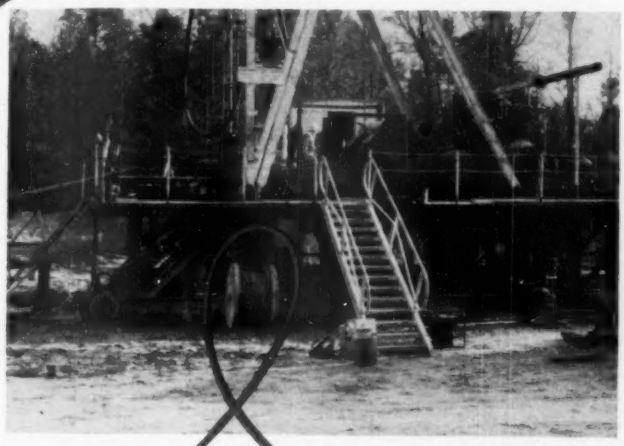
LOUISVILLE 10, KENTUCKY
BRANCH OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO, ST. LOUIS, DALLAS

MORE *ton miles*



Ask for a copy of
WIRE LINES FOR DRILLERS.

No way has been found to buy *ton miles* for less money. One J&L Wire Line leads to another. Try one.

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When you need... VERSATILE ...RELIABLE ...Low Cost Boat Power

EVINRUDE
OUTBOARD MOTORS

LOOK SHARP at the savings when you power *any* type of boat with an Evinrude instead of an inboard engine. *Low initial cost* . . . and that cost is *all!* No expensive installation work—no accessories—no "extras"—all of which can easily total more than the original engine cost.

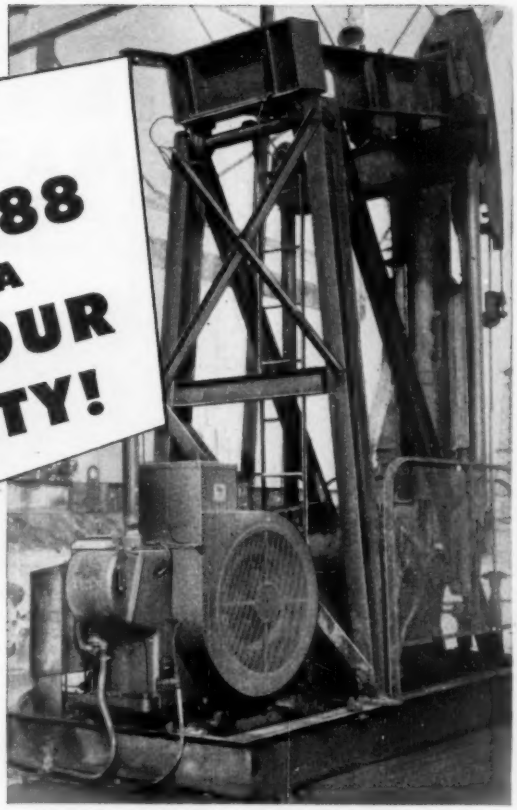
More important, look at the *advantages.* Complete portability. Motors can instantly be transferred from boat to boat. No sacrifice of hull space. Utmost simplicity of operation and servicing. Safe and efficient running in shoalest waters. Complete maneuverability with gearshift which provides Neutral, Forward, Reverse.

Wherever power requirements are under 30 H.P., Evinrudes are the logical choice. For literature describing the complete Evinrude line, write EVINRUDE MOTORS, Dept. C, 4165 N. 27th St., Milwaukee 16, Wis.

In Canada: Manufactured by Evinrude Motors, Peterborough, Ontario.

26-ft. waterfront work boat employed in ferrying and general utility service. Carrying capacity up to 8 tons. Speed, to 15 m.p.h. with 25 H.P. Evinrude, depending on load. An exceptionally capable and useful craft.

Only LE ROI A-288 OFFERS YOU A 10,000-HOUR WARRANTY!



Past performance makes this amazing 14-month warranty possible

No ordinary pumping engine — only Le Roi A-288's unusual record of uninterrupted pumping service in actual installations — gives you this unprecedented warranty. Over 14 months (10,000 hours) of dependable pumping! Within that time you spend not one cent for repair parts — A-288 performance assures it — Le Roi guarantees it!

While other engines are ready for the replacement tag at 10,000 hours, the Le Roi A-288 is just nicely broken in — ready for thousands more hours of dependable service. One typical installation shows more than 47,000 hours with practically no downtime and still going strong — proof of sturdy stamina.

Just look at a few reasons for the A-288's dependability . . .

- Patented, closed "vaporizing-condensing" cooling system requires almost no make-up water — keeps temperatures uniformly high and prevents sludging even in sour gas areas.
- The A-288 is the only pumping engine to be recommended by one major user for continuous service *unattended for up to two weeks at a time.*
- Short, solid, properly counterbalanced crankshaft is 5" in diameter, has extreme overlap between crankpin and main bearing journals for added strength.
- No shut-down is required for inspection or adding oil.
- Heavily constructed and internally ribbed integral crankcase and base is rigid to resist distortion due to temperature differences or faulty mounting.

Send the coupon today for up-to-the-minute details on the new A-288 10,000 hour warranty. And take a look at the list of Le Roi distributors, an important cog in Le Roi's 3-way partnership, that means more efficient service to you.

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Plants: **Milwaukee • Cleveland • Greenwich, Ohio**

Oil-field Headquarters: **Tulsa, Oklahoma**

Oilfield Sales-Service Network

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Le Roi Company Branch — Tulsa
Carson Machine & Supply Co. — Oklahoma City

East & South Texas, Gulf Coast
Southern Engine and Pump Company — Houston, Kilgore, Edinburg, Dallas, San Antonio, Corpus Christi, Texas, and Lafayette, Houma, Louisiana.

North & West Texas, New Mexico
General Machine & Supply Co. — Odessa, Syndar, Texas.
Nortex Engine & Equipment Co.—Wichita Falls, Texas.

Kansas
Carson Machine and Supply Co.—Great Bend

Illinois — Western Kentucky
Western Machinery & Engine Company — Centralia, Illinois and St. Louis, Missouri.

Michigan
Hafer Engine Service — Reed City

Rocky Mountain Area
Gehring Equipment Co. — Casper, Wyoming, Rangeley, Col.

Mississippi, Arkansas and Northern Louisiana
Ingersoll Corporation — Shreveport, Louisiana, Jackson, Mississippi, El Dorado, Arkansas

West Coast
Le Roi-Rix Machinery Co. — Los Angeles, Long Beach and Bakersfield, Calif.

Appalachian Area
P. C. McKenzie Co., Pittsburgh, Bradford.

Canada
Lucey Export Ltd. — Calgary, Edmonton, Alberta.

Le Roi Company
302 N. Cincinnati Ave., Tulsa 3, Oklahoma

Gentlemen:
I don't believe it! Show me how you can afford to offer a warranty on this pumping engine and make it good for 10,000 hours — the equivalent of over 14 months operation — running 24 hours a day. Send the proof to:

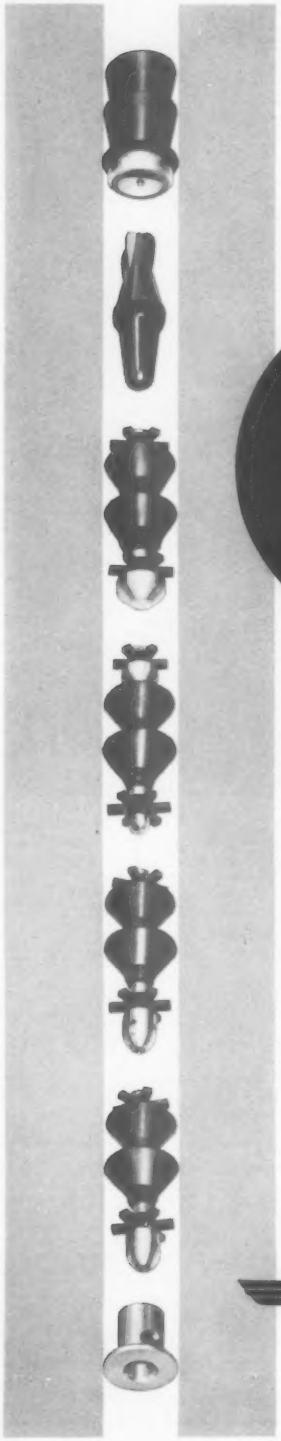
Name..... Title.....

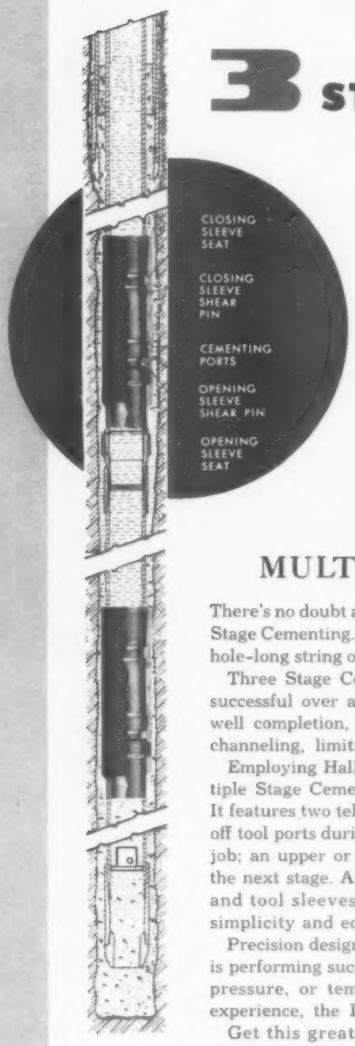
Company.....

Address.....

City..... Zone..... State.....

P-117





3 STAGE CEMENTING IS MORE ECONOMICAL!

HALLIBURTON'S DV MULTIPLE STAGE CEMENTER

There's no doubt about the savings possible by Halliburton's Multiple Stage Cementing. It isolates both shallow and deep zones, eliminates a hole-long string of casing, saves you time, money, cement *and casing*.

Three Stage Cementing is even more economical. It has proven successful over a wide range of jobs – full depth cementing, dual well completion, cementing off formations at any point, reducing channeling, limiting pump pressures, and preventing slurry loss.

Employing Halliburton's unique Differential Valve, the DV Multiple Stage Cementer uses the differential principle of hydraulics. It features two telescoping sleeves. The lower or opening sleeve seals off tool ports during circulation and passage of cement for the lowest job; an upper or closing sleeve seals tool ports after completion of the next stage. A special arrangement of opening and closing plugs and tool sleeves gives you three stage cementing with utmost simplicity and economy.

Precision designed and ruggedly built, Halliburton's DV Cementer is performing successfully in thousands of wells regardless of depth, pressure, or temperature. Backed by Halliburton's million job experience, the DV is gaining increased respect of the industry.

Get this greater economy offered by the DV Multiple Stage Cementer. Your nearby Halliburton representative will tell you all about it. Halliburton Oil Well Cementing Company, Duncan, Okla.

HALLIBURTON

YEARS AHEAD IN ADVANCED CEMENTING TECHNIQUES

They Say—

Imports too High . . .

"The evidence submitted to the Texas Railroad Commission clearly revealed that many of the importing companies are not disposed to support in practice the policies to which they have expressed agreement.

"Fair and equitable relationship should obtain between total imports of crude oil and its products and total demand for oil in the United States during periods of excess availability of domestic oil for U. S. consumption.

"We are now experiencing such a period of excess availability. But due to the actions of the importing companies a proper relationship between import volumes and demand is not being maintained.

"Demand in 1953 will be 30 per cent greater than in 1949 when imports were harming the domestic industry. If imports increased by this same 30 per cent from 1949 they would average 840,000 bbl. daily in 1953 instead of the 1,100,000 bbl. anticipated.

"The importing programs presented to the Texas Railroad Commission indicate total imports will consume 13.5 per cent of the domestic market this year.

"There is no basis which would support the necessity for such increases in imports. The importing companies should immediately revise their plans for 1953 leading to a reduction of at lease 300,000 bbl. daily."

Charlton H. Lyons, president, Independent Petroleum Association of America, in an official statement following the Texas Railroad Commission hearing on imports.

Funny Sort of Business

"A direct cancellation of the (Truman tidelands) order by President Eisenhower would avoid any current complications and remove from the books what now is pronounced, in effect, a pointless and lawless decree.

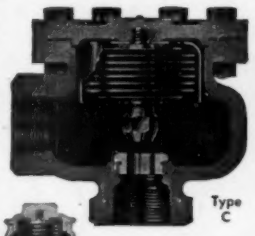
"Mr. Brownell's research reveals to him, he states, that Mr. Truman's own attorney general, Mr. McGranery, objected to the 'naval petroleum reserve' feature but approved the other, curiously enough, on the understanding there was no intent to do, and no factual or legal basis for, what the presidential order clearly, on its face, did seek and purport to do. This is a funny sort of business indeed; and it's

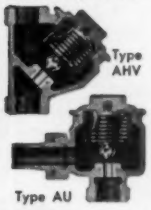
NICHOLSON TRAPS

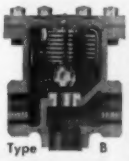
SAVE 4580 LBS. OF STEAM Per CYCLE

A large user of steam on the west coast reports that substitution of Nicholson traps for a mechanical type effected a cyclic saving per dryer of 550 gallons of condensate, or 4580 lbs. of steam. See why leading plants are increasingly adopting Nicholsons for the higher and more even temperatures which result from their advanced features: operate on lowest temperature differential; 2 to 6 times average drainage capacity; maximum air venting.

BULLETIN 152







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Those ever-present dangers call for the security that expertly erected Page Chain Link Fence has provided to businesses such as yours for more than 60 years. Choose one of the several styles in your choice of metals—heavily galvanized Copper-Bearing Steel, long-lasting Stainless Steel, or corrosion-resisting Aluminum. Consult the technically trained Page erecting firm nearest you—one of more than 100 conveniently located throughout the country. For name and data . . .

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Los Angeles, Philadelphia, New York or San Francisco.

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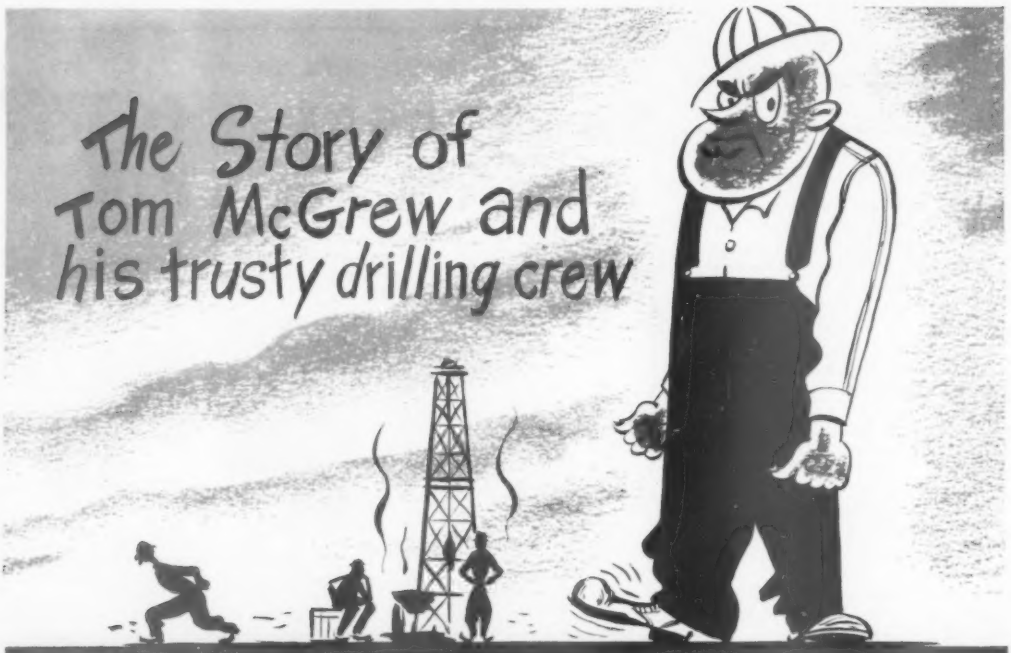

This is the story of Tom McGrew—
a tool pusher and his trusty crew.
They were going great guns on McFudd No. 1
when the rig broke down and spoiled all the fun.
They worked and they sweated and they cursed the day
that had brought them this trouble and caused delay.
On into the night—it was really a chore
patching old parts to get started once more.
But each new effort ended in despair
and Tom finally admitted, "It's beyond repair."
It would look pretty bad on the drilling report
for a crew with such talent to be caught so short.

The gloom of the night showed up in each eye.
Until George True, star driller, yelled United Supply!
"You're right, said Tom, his face shining bright
they'll get us the parts and relieve our plight.
Soon a truck was speeding to McFudd No. 1
With everything needed to get the job done.
So the moral of our story is plain to see
that from United you get Service and Dependability.
And whenever you're needing supplies in a hurry
just call United and then don't worry.
You'll get them real quick, and that is why
You can always rely on United Supply!

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UNITED SUPPLY

AND *Manufacturing* COMPANY

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Stores in: KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

COURTESY • SERVICE • DEPENDABILITY

a pity Mr. McGranery's official views didn't come out at the time.

Editorial in the New Orleans Times-Picayune.

Plan for the Middle East

"The oil of the Middle East could be used just as advantageously by Russia for the development of Communist China and other parts of the Far East friendly to the Soviet as it is being used by the Free World for the building of its own strength.

"We must seek in every way to bring to the mass of the people in the Middle East the benefits of our activities there. We must continue to show these nations how to use the wealth their oil is giving them so that it brings more comfort, more productivity, and more security to all their peoples."

John C. Sample, vice president, General Petroleum Corp., addressing the Whittier (Calif.) University Club.

Another Tidelands View . . .

"To understand this (tidelands) battle, keep your eye on two big facts:

1. This is the payoff. During last year's election campaign an 'oil trust' representative wrote General Eisenhower, asking what stand he, as President, would take on the offshore oil issue.

"Eisenhower wrote a reply which 'leaked' into newspapers . . . Thus assured . . . oil magnates backed him with their money and political power . .

"Now comes the payoff. The trust's friends in Congress are attempting to rush through an offshore oil 'giveaway' bill.

"2. The other big fact is this: Any senator or congressman . . . who votes for the 'giveaway' oil bill is voting to take money away from the people who elected him . . . If the 'giveaway' bill is defeated, Uncle Sam will keep control of the offshore oil, as the Supreme Court said he should, and all the Amercian people, of all 48 states, will share the $100 billion revenues."

Labor, official Washington weekly newspaper of 15 railroad labor organizations.

Oil's Capacity Now Exceeds Demand

"Our analysis of conditions in the oil business leads us to conclude that capacity in all phases of the industry now exceeds demands.

"We anticipate that the growth in demand for petroleum will continue at a normal rate of between 3 and 5

Rugged, extra-strength BLOCKS engineered for oil industry needs

SHOWN at left is a Model 4140 Washington moving block of 30-ton capacity, designed for 1½" wire rope. Manganese sheave, cast steel sides, bronze bushed—an extra strong, *economical* block for heavy moving and construction work.

Other models of Washington blocks adaptable to oil field construction and operation include cat blocks, rigging blocks, snatch blocks and hoisting blocks. All are designed for extra strength and long life. All are backed by outstanding manufacturing facilities and specialized experience in block production.

Write for Catalog No. 35, showing the full line of Washington blocks, fairleaders and related equipment. Address Washington Iron Works, 1500 6th Ave. South, Seattle 4, Washington.

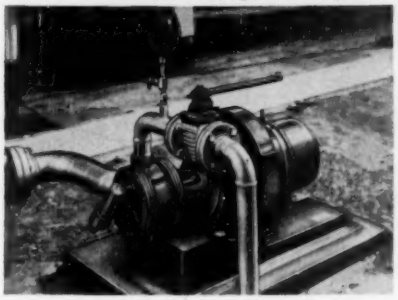
WASHINGTON IRON WORKS
Since-1882

WASHINGTON IRON WORKS

TAKE A TIP FROM THE LEADERS

Install VIKING Field Gathering Pumps

The use of Viking Rotary pumps by many of the oil producers in field gathering operations is your assurance of dependable, efficient pumping.



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Fast, self priming
Smooth, even discharge
Complete range of capacities
Pressures to 200 psi (Heavy-duty)
Handling many types of crudes and refined oils

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VIKING PUMP COMPANY
Cedar Falls, Iowa

per cent annually, depending upon general business conditions. With such a growth in demand, there is no question but that the industry will probably continue to provide a surplus capacity, and this will restore much of the flexibility which unusual annual increases in demand have dissipated.

"Should the Iranian problem be corrected, that nation's petroleum supplies would undoubtedly reenter the international petroleum trade. Unless additional crises develop in the international picture, it would seem that the forces of supply should tend to dominate those of demand, and under the circumstances, pressure on petroleum products prices may be anticipated, but we do not expect these pressures to be strong enough next year to affect crude-oil prices."

J. C. Donnell, II, president, Ohio Oil Co., speaking before the New York Society of Security Analysts.

Oil Is Integrated

"As long as there are different segments of the oil industry there will be conflicts of ideas and opinions, but mark you well—any obstacle thrown in the path of any part of our industry will wreak havoc all along the line.

"You are closely allied with—you are integrated with—each other segment of the oil industry. Don't think otherwise."

Hoyt R. Ogram, Kanotex Refining Co., addressing the Iowa Independent Oil Jobbers Association, Des Moines, Ia.

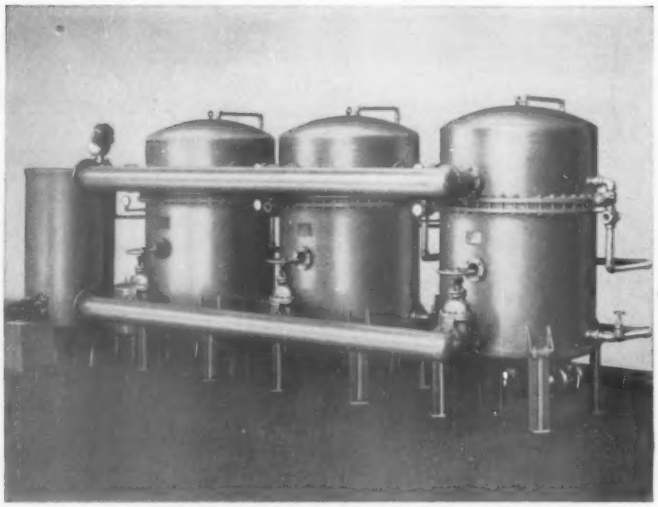
Oil Dictates Peace or War

"The atomic age is upon us, but oil remains the strategic material that will decide whether we are to have peace of sorts or another world war.

"At the moment the bulk of the world's oil resources is under our control and helps keep the peace. But if the oil resources of the Middle East, which lie temptingly close to the Russian sphere, were to come under Russian control, the oil balance would shift to the Soviet side and war in our time would become a virtual certainty."

Gen. Carl Spaatz, retired, writing in Newsweek.

BOOST WATER FLOOD RECOVERY with ADAMS *PORO-STONE* FILTRATION



3 unit Adams "packaged" filtration plant ready for installation in the field.

Water clarity is often the critical factor in recovery from oil-bearing sands. To keep open the minute passages through which the working strata must be pressurized, calls for water that is free from solids.

ADAMS *PORO-STONE* FEATURES

- permanent filter mediums
- easy backwashing without disassembly
- packaged ready for indoor or outdoor installation
- range of capacities for all applications
- with or without facilities for filter aid, algecides, anti-bacterials

Call or Write for the name of our representative in your area. Send for Bulletin No. 691.

R. P. ADAMS CO., INC. 213 E. PARK DR. BUFFALO 17, N. Y.

CALENDAR OF EVENTS

MAR.

15-20 American Chemical Society, petroleum division, spring meeting, Statler Hotel, Los Angeles.

16-20 National Association of Corrosion Engineers, ninth annual conference and exhibition, Hotel Sherman, Chicago.

18-20 American Petroleum Institute, division of production, Mid-Continent district meeting, Mayo Hotel, Tulsa.

23-25 Western Petroleum Refiners Association, annual meeting, Plaza Hotel, San Antonio, Tex.

23-26 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, and Society of Exploration Geophysicists, joint annual meeting, Sam Houston Coliseum, Houston.

23-27 Western Metal Exposition and Congress, technical sessions, Statler Hotel, Los Angeles.

25-27 Society of Automotive Engineers, national production meeting, Hotel Statler, Cleveland.

28 North Texas Oil and Gas Association, annual meeting, Kemp Hotel, Wichita Falls, Tex.

30-31 Texas Independent Producers and Royalty Owners Association, annual meeting, San Antonio.

APR.

Apr. 1 Mid-West Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

1- 9 American Association of Oilwell Drilling Contractors, eighth annual drilling industry safety clinic, Baker Hotel, Dallas.

7- 8 American Gas Association, research and utilization conference, Hotel Statler, Cleveland.

7- 9 Petroleum Industry Electrical Association, annual convention and exhibit, Shamrock Hotel, Houston.

8-10 American Petroleum Institute, division of production, Eastern district meeting, William Penn Hotel, Pittsburgh.

Men who depend on power...know they can depend on CUMMINS®

CUMMINS DIESELS **are engineered to make light work of tough jobs**

Why do oil field operators count on Cummins for dependable power in toughest going?

You'll find part of the answer in the special kind of versatility that belongs to Cummins Diesels alone. It's versatility that goes beyond the handling of all kinds of jobs. It's actually an ability to meet every power requirement that any situation demands . . . to save on fuel, do more work per dollar, whether the call is for continuous power or stop-and-go operation over a wide and flexible speed range.

Yes, you can count on a (60-600 h.p.) Cummins Diesel for dynamic versatility in every job — performance that stems from an exclusive fuel system and precision engineering. See your Cummins dealer for all the facts. He's a diesel specialist . . . ready to help solve your power problems.

CUMMINS

***Leaders** in rugged, lightweight high-speed diesel power!*

CUMMINS ENGINE COMPANY, INC., Columbus, Ind. *Export:* Cummins Diesel Export Corp., Columbus, Ind., U.S.A. • Cable: CUMDIEX

13-15 American Society of Lubricating Engineers, eigth annual meeting, Hotel Statler, Boston.

15-17 National Petroleum Association, midyear meeting, Cleveland.

20-22 American Petroleum Institute, Division of Transportation, products pipe-line conference, Hotel Muehlebach, Kansas City.

21 Association of Consulting Chemists and Chemical Engineers, Inc., Hotel Belmont Plaza, New York City, symposium and dinner.

21-23 Southwestern Gas Measurement Short Course University of Oklahoma, Norman.

22-24 American Association of Petroleum Geologists, Rocky Mountain section meeting, Casper, Wyo.

22-24 American Institute of Electrical Engineers, southern district meeting, Hotel Seelbach, Louisville, Ky.

24-25 Interstate Oil Compact Commission, spring meeting, Roosevelt Hotel, New Orleans.

26-29 American Institute of Chemical Engineers, Chemical Institute of Canada, joint meeting, Royal York Hotel, Toronto, Ont.

27-28 Independent Petroleum Association of America, mid-year meeting, Jefferson Hotel, St. Louis.

Apr. 29-May 1 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

Apr. 30-May 1 American Gas Association, transmission and storage conference, Edgewater Beach Hotel, Chicago.

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KRAFTBILT Cabinets are
BUILT TO LAST
a lifetime!
Kraftbilt cabinets are designed to HOLD more—yet occupy less space. One compact Rollfile section stores 112 rolled maps; one Log Cabinet takes 7500 well logs! The various needs of geologists are met by cabinets of several sizes and designs. Illustrated Bulletin 352-B gives full details.
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E-28 Electric Log Cabinets, holds 4,800 reduced logs.
G-34, G-36 Log Cabinets file 7,500 strip logs.
V-56 Vertical Rollfile, with lock. 56 maps.
Visit KRAFTBILT Booth at International Petroleum Exposition, Tulsa, May 14-23.
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MAY

4- 5 American Petroleum Institute, division of marketing, midyear meeting, Baker Hotel, Dallas.

4- 6 Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.

5- 6 Gas hydrate control conference, University of Oklahoma, Norman.

6- 8 American Society of Training Directors, ninth annual conference, Sheraton Plaza Hotel, Boston.

7- 8 American Petroleum Institute, Rocky Mountain district, Division of Production, spring meeting, Gladstone Hotel, Casper.

11-13 Southern Gas Association, Jung Hotel, New Orleans.

11-14 American Petroleum Institute, Division of Refining, midyear meeting, New York.

13-14 Pacific Coast Gas Association, annual gas supply and transmission conference, Santa Barbara, Calif.

14-23 International Petroleum Exposition, Tulsa.

15-16 International Gas Union, council meeting, Paris, France.

19-22 The Institute of Gas Engineers, ninetieth annual meeting, London, England.

21-23 Panhandle Geological Society, field trip, Yucca Hotel, Raton, N. M.

24-27 American Gas Association, production and chemical conference, Hotel New Yorker, New York City.

25-29 American Society of Mechanical Engineers, annual conference and exhibit, oil and gas power division, Hotel Schroeder, Milwaukee.

27-29 Texas College of Arts and Industries, Kingsville, eighth annual short course in gas technology.

28-29 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Broadview Hotel, Wichita.

28-29 Natural Gas and Petroleum Association of Canada, London, Ont.

28-30 West Texas Geological Society, annual field trip, Marfa, Tex.

JUNE

2- 3 American Petroleum Institute, Division of Production, Pacific Coast District, Statler Hotel, Los Angeles.

4- 5 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington, Ky.

7-12 Society of Automotive Engineers, summer meeting, The Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J.

14-18 Canadian Gas Association, Windsor Hotel, Montreal, Canada.

15-19 American Petroleum Institute, Division of Production, midyear committee conference, Hotel William Penn, Pittsburgh.

16-19 American Welding Society, national spring technical meeting, Shamrock Hotel, Houston.

JUNE 16-JULY 2 Intensive Course and Research Conference on Phase Behavior of the Hydrocarbons, University of Michigan, College of Engineering, Ann Arbor.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Conrad Hilton Hotel, Chicago.

18-19 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

JUNE 29-JULY 3 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

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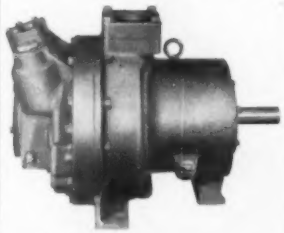

The Pyle-National line of highly efficient impulse type turbines is ideal for prime movers and standby drives on pumps, generators and other equipment in refineries . . . also for drilling site equipment such as shale shakers, pumps, bug blowers, generators, etc.

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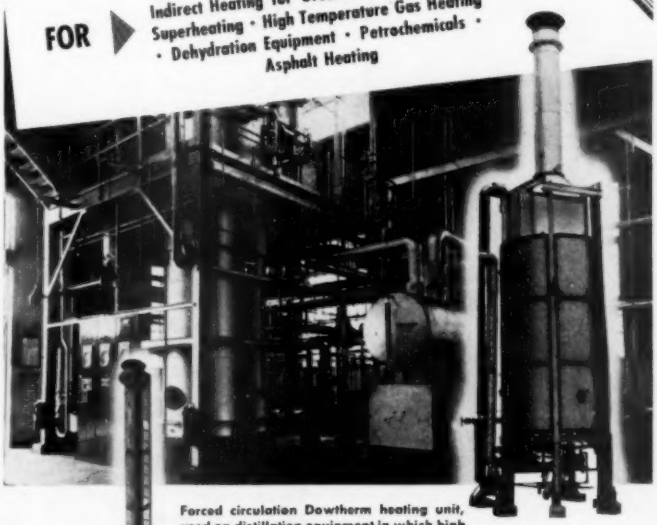
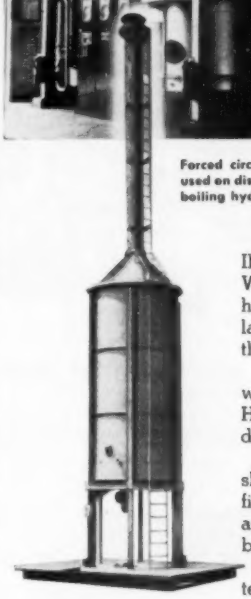


Forced circulation Dowtherm heating unit, used on distillation equipment in which high boiling hydrocarbons are handled.



Shop assembled oil heater used for indirect heating of grease kettles, at plant of a leading oil company.

Illustrated are a few of many uses of Struthers Wells direct fired heaters. Where indirect heating is used with these heaters, the circulating medium may be oil or Dowtherm, with the Dowtherm used in vapor or liquid phase.

Heating systems may be supplied complete with all instruments, controls and burners. High thermal efficiencies may be secured, if desired, using finned tube convection surface.

Heaters to about 10,000,000 Btu may be shipped completely assembled and ready for field erection, except for structural platforms and stacks. Larger units are field assembled, but require a relatively small amount of labor.

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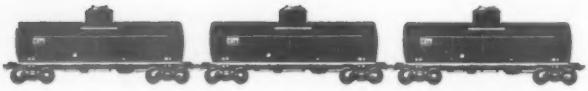

For dependability, the 46,000 tank cars in the GATX fleet are designed, built and operated by General American

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Here's how not to get oil for defense

THE Navy Department is asking Congress for permission to drill 39 wells and increase production in Elk Hills field—Naval Petroleum Reserve No. 1—because an influx of water into the reservoir threatens to drive the oil off the reservation.

What's new about this? Nothing. But it again illustrates the futility of the whole concept of petroleum reserves.

For some 30 years the Navy has been going to Congress for permission every time it wanted to drill some wells, let a contract, or make any operating changes at Elk Hills. This method of operation is hopelessly inefficient in this fast-moving and unpredictable oil business where so much depends on the ability to make quick decisions on the basis of technical data.

Oil producers have plenty of trouble as it is in trying to work out a unit operation or other cooperative action affecting an oil field. If the Government were a partner and every decision had to go through a chain of bureaucracy and finally to Congress, the oil industry as we know it would be impossible. Anybody who entertains the notion that government operation of oil is desirable should compare the history of Elk Hills with that of just about any other field in the country.

AS a supply of oil for national defense, Elk Hills has been a complete and expensive flop, and there is no reason to believe that any other reservation would be any better. But despite this dismal history, some people are advocating that the tidelands, and other areas, be set aside as military oil reserves.

Suppose the tidelands were made into a second Elk Hills. Existing wells would be operated in order to get some revenue and to test the area's producing ability, but whenever the federal agency in charge wanted to do any exploratory or development work it would have to justify the expenditure through the red tape of the Budget Bureau and Congress.

Not only does this procedure usually take about a year, but the technological basis for the program would have to be explained to scores of laymen and politicians, none of them oil men but all motivated by special interests or personal suspicions. That's no way to run an oil operation. The result would be just as minuscule a volume of oil for national defense as Elk Hills has supplied.

THE whole concept of a special "reservation" of oil lands for possible future use by a single consumer is based on a false premise and a lack of understanding of the nature of oil and the needs of national defense, as the Elk Hills folly should have demonstrated clearly.

The way to get oil—or anything else—for defense is through a healthy national economy where operating decisions are made in businesslike ways.

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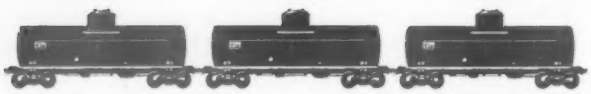

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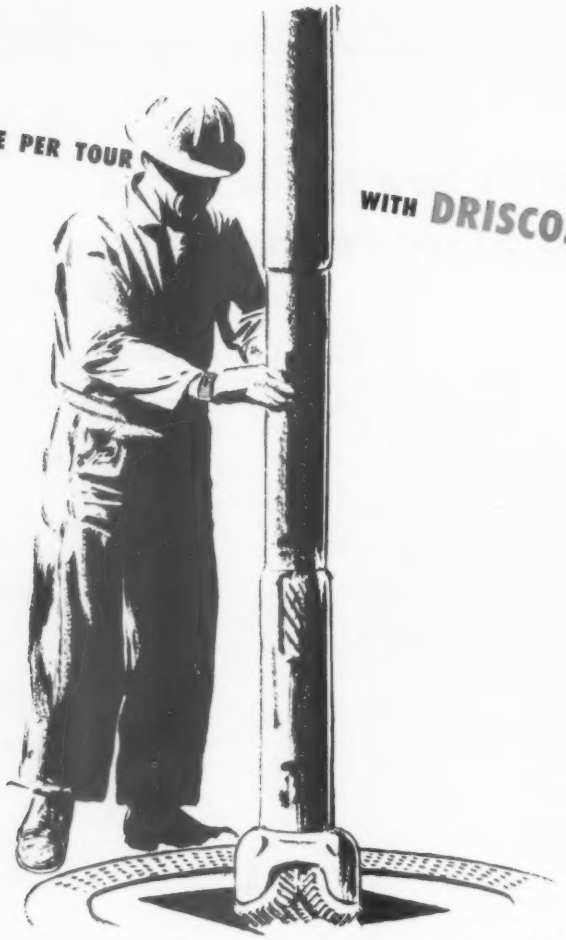
GET MORE FOOTAGE PER TOUR

WITH DRISCOSE* BASE MUD



Time after time, drillers see that DRISCOSE base mud helps them get down to contract depth with less rig time and fewer bits used. DRISCOSE base muds exhibit better lubricating qualities. Mud engineers rely on DRISCOSE to give conventional or emulsion muds the very best in thixotropic qualities, too. In field after field, small amounts of DRISCOSE maintain high suspension of cuttings with good control of viscosity and gel. And DRISCOSE gives you all the advantages of a thin, strong filter cake . . . low water loss! Order DRISCOSE today from your mud dealer.

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THIS WEEK

GOING UP AT THE I.P.E. GROUNDS is this 140-ft. cantilever-type mast which will be a feature attraction in the exhibit of Bethlehem Supply Co. The 1953 International Petroleum Exposition won't open its doors to the public until May 14, but two derricks already tower over the grounds and all exhibit space has been sold. Workmen of both the exposition and individual exhibitors last week were busy erecting new buildings and remodeling old for this year's record exposition, which will have on display oil-industry equipment valued in excess of an estimated $100,000,000.

INTERNATIONAL.—Anglo-Iranian's Kent refinery, near London, goes into operation with initial throughput of about 40,000 bbl. daily. . . . Crude unit, largest in Europe, will process 80,000 bbl. daily later this year. . . . ¶Gulf reported now considering construction of a 20,000-bbl. refinery at Antwerp. . . . ¶Peru auctions 110 exploration parcels covered by duplicate applications, completing project of granting new concessions. . . .

SECONDARY RECOVERY.—Atlantic Refining Co. reveals its high-pressure gas-injection experiment in University Block 31 field in Crane County, West Texas, is resulting in recovery of up to 52 per cent of the oil in place. . . . Efficiency of technique, Atlantic researchers say, depends on whether gas is miscible or immiscible with reservoir fluid. . . . ¶Long Beach Harbor Department reported nearly ready to call for bids on drilling of water-injection well and construction of a treating plant for pilot-injection program in Wilmington field. . . . Experiment may lead to flood of entire field. . . .

GOVERNMENT.—Mississippi Supreme Court reverses itself, rules state cannot levy a privilege tax on interstate pipe lines crossing it. . . . ¶Oklahoma Corporation Commission resumes hearings on case to determine whether a state regulatory body has authority to set minimum wellhead gas prices in an oil field. . . . ¶PAD forecasts an increase of 60 per cent in civilian avgas demand in 10 years.

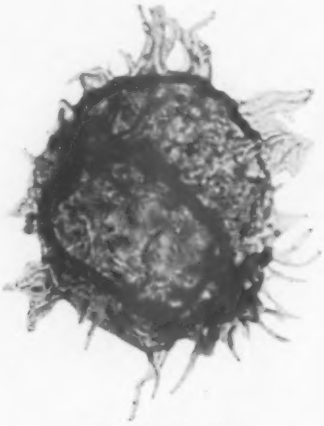
EXPLORATION.—Use of fossil pollen and spores to determine the age of rock formations is disclosed by Carter Oil Co. . . . Development provides more complete identification of rocks since fossil and pollen are found more frequently than larger fossils, they are not damaged by the drilling bit, they are found in shales, which often contain no foraminifera. . . . Carter technologists also say they can contour shore lines of ancient seas using photographs of magnified specimens taken from several wells. . . . ¶New structure in Los Angeles Harbor found. . . . Harbor Commission consultant recommends testing the anticline by a slant-drilled well from an upland location. . . .

PIPE LINES.—First crude to flow through $35,000,000 Rancho crude line from West Texas scheduled to arrive in Houston over the week end. . . . Newly completed 457-mile, 24-in. line will move 210,000 bbl. of crude initially from McCamey, Tex. . . . ¶Sinclair delivers first crude through its new 674-mile, 22 and 24-in. system from Drumright-Cushing, Okla., area. . . .

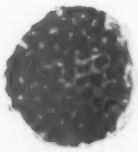
TRENDS.—Operators drilled 372 fewer wells in January and February than in the same months last year. . . . Drilling in Texas was off 514 wells with 398 of the loss in West Texas. . . . Important increases were reported for Williston basin, Illinois-Indiana, Oklahoma, South Louisiana, New Mexico, and Alabama-Florida. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,529,775 bbl. daily for week ended February 28, down 20,425 bbl. daily. . . . ¶Total well completions were off 100 wells for the week to 836. . . . Wildcat completions totaled 179 wells compared with 197 for preceding week and 196 for same week last year. . . . ¶Rotary rigs operating in United States on March 2 totaled 2,428, down 236 rigs from corresponding date in 1952 but up 331 rigs from 1951 and 466 from 1950. . . .

Microforaminifer



Hystrichospherid



Pine pollen (above) and fern spore.

NEW SUBJECTS FOR RESEARCHERS are these minute forms of plant and animal life, shown here magnified 800 times. At left are the fossilized remains of two one-celled marine animals. At right are photographs of fossil pollen and spore specimens.

New Exploration Tool

Fossil pollen and spores used in new approach to job of determining age of rock formations cut by driller's bit

Ted A. Armstrong

TULSA.—One of the most significant developments in exploratory geology in recent years was revealed last week by Carter Oil Co.

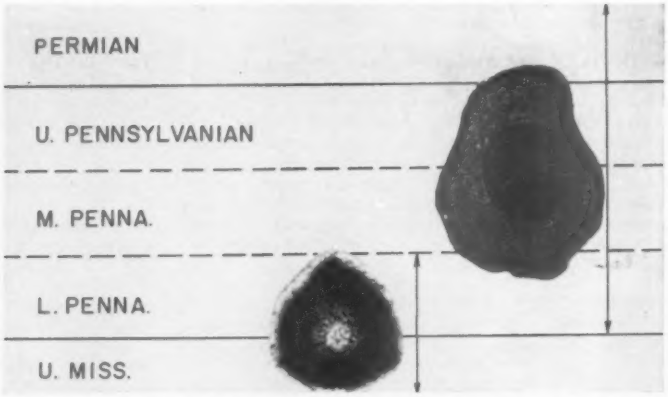
The company disclosed it is now using fossil pollen and spores to determine the age of rocks and to locate the shore lines of ancient seas.

Years of research, studying and cataloging the infinitesimal microfossils taken from cores and cuttings, has enabled the company's technologists to build up a reference library permitting them to identify rock formations cut by the driller's bit throughout the world.

The new development means that more complete identification of rock formations is now possible, for several reasons.

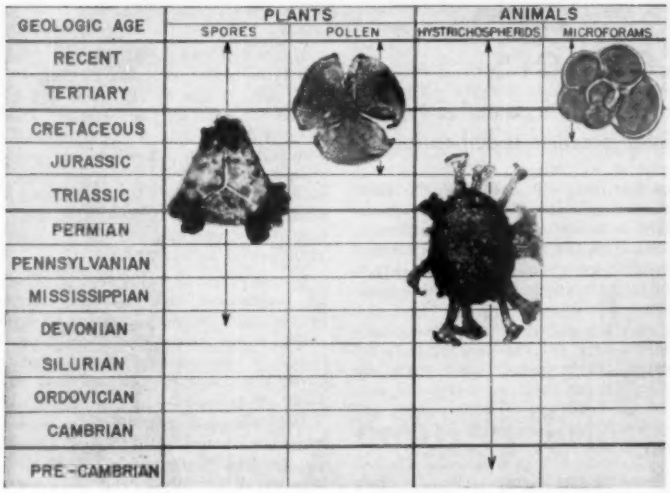
... Fossil spores and pollen are found in about 45 per cent of all well cuttings, while foraminifera and larger fossils, are found normally in less than 1 per cent. This means that many

PREPARING TO PHOTOGRAPH a magnified fossil spore in the Carter laboratory is Raymond E. Malloy, junior research geologist working with Dr. Hoffmeister in the exploration research program.



HOW A ROCK'S AGE CAN BE DETERMINED is shown in this chart. A core from a well being drilled in Mississippi was sent to the Carter lab. The geologist on the well knew it was drilling in this range, but was unable to identify specifically the formation. In the core the Carter technologists found these two fossil pollen, both from a now-extinct plant. Previous research had shown that the one at left could be found only in Lower Pennsylvanian and Upper Mississippian formations, while the one at right ranged from the Permian through the Lower Pennsylvanian. Since both were found in the core, the core sample was positively identified as coming from the Lower Pennsylvanian.

Geologic Ranges of Major Microfossil Groups



DEVELOPER of the new technique is Dr. W. S. Hoffmeister, widely known paleontologist, who has been working on this project 7 years.

rocks whose age cannot be determined by other means, now can be positively identified.

. . . Shales, which often contain no foraminifera, now can be identified according to age, since they frequently do contain the spore and pollen fossils.

. . . While foraminifera often are destroyed by the grinding action of the drilling bit, the miscroscopic pollen and spores are not damaged.

. . . Shore lines of ancient seas now can be determined by pollen and spore studies, together with studies of fossils of one-celled animals, using cuttings from as few as three wells.

In locating the shore lines, valuable since a great deal of oil is believed to be associated with ancient beaches, the Carter technologists count the pollen, spore, and animal microfossils, noting the well from which each came.

Their studies have shown that spore and pollen fossils are most numerous near the old shore line, decreasing in number seaward. The remains of one-celled microscopic animals, the hystrichospherids and microforaminifera, however, are found farther seaward, where the animals lived in the water. With this knowledge, and using cuttings from wells penetrating the beds of ancient seas, the technologists can determine the approximate location of the shore line. With cuttings from additional wells in the area, they can prepare a contour map of the old shore line.

Significance . . . The newly announced method of determining a rock's age by a study of its microfossils is expected to supplement, rather than curtail or eliminate, present geological methods.

The studies, however, represent the development of a new science comparable in probable importance to the introduction of micropaleontology into the petroleum industry. It is considered possible that the pollen-spore studies eventually may surpass ordinary methods of micropaleontology in ultimate value to the exploration geologist.

Carter's program . . . Carter's pollen and spore research program is under the direction of Dr. W. S. Hoffmeister, senior research geologist, who has been working with the microfossils since 1946. Working with him is Raymond E. Malloy, junior research geologist.

Core chips or cuttings received at the laboratory are powdered and then digested with hydrofluoric acid. After further routine processing, they are prepared as slides for the microscope. As they study the new arrivals, Hoffmeister and Malloy photograph at 800 magnifications the significant microfossils. These photographs then are mounted, numbered, and the data on each specimen is filed for reference.

To date the Carter research team has photographed and cataloged nearly 14,000 microfossils from about 600 wells in the United States, Colombia, Venezuela, Peru, Canada, and Sumatra. In addition to cores and cuttings, the studies also have included samples from representative outcrops.

In addition to classifying the microfossils according to age, the Carter men have developed classifications according to environment, permitting them to identify the minute animal fossils as to their origin in either marine or continental waters.

Practical example . . . How the new age-determining method has been used is described in the latest issue of The Link, Carter's company magazine.

A Carter geologist following a company wildcat in Rosebud County, Montana, concluded that the well probably had left the Jurassic and was then drilling in Paleozoic rocks. Reliable markers, however, were missing. The geologist airmailed a bag of core chips to the Carter laboratory in Tulsa. An hour after its arrival, Hoffmeister was able to call Montana and assure the geologist his well still was drilling in Jurassic rocks.

The microfossils . . . Appearance of the microfossils varies widely. Magnified 800 times, they range in size from a dime to larger than a silver dollar. Shape and surface markings also differ markedly.

Hoffmeister says fossil pollen as old as 150 million years, dating back to the Jurassic age, have been found. Fossil spores are older, going back 350 million years to the Devonian. Microforaminifera, however, are the most recent, dating back only through the Cretaceous. Oldest of the microfossils are the hystrichospherids, which have been found in pre-Cambrian rocks more than 500 million years old.

Two or three other companies are interested in the pollen and spore studies and have devoted some research efforts to them, but none is believed to have progressed nearly so far yet as have the Carter technologists.

Problem for Refiners

Residual fuel found highly corrosive in locomotive-type gas turbines, pointing to stricter product specifications

D. H. Stormont

LOS ANGELES.—Sodium-vanadium and calcium-vanadium ratios may not be important specifications when a residual fuel is to be burned in boilers but they become of prime importance if it is to be used in locomotive-type gas turbines.

Union Pacific Railroad Co. has found that out in its operations of turbine-electric locomotives for pulling heavy freight trains in the mountainous area of Utah and Wyoming. Vanadium and sodium-sulfur compounds in the residual ash deposits formed in the combustion tubes and on turbine blades are highly corrosive at the elevated temperatures which exist in these sections.

The company placed its first low-gravity fuel turbine in experimental service in 1949. First regular-service unit was placed in operation about 1 year ago. Six now are operating and by July 10 will be in service.

What it means . . . Extensive conversion back to residual-fuel-consuming locomotives would help solve one major problem of refiners while creating a new one.

A switch back to residual would increase the market for this product, now in more than ample supply. At the same time, middle-barrel cuts being used in diesel-propelled locomotives would be available for cracking or industrial use.

But in view of the corrosive action of present heavy fuels in gas-turbine use, this problem probably would wind up in the lap of the refiner in the form of more-stringent specifications.

What is being done . . . Progress in solving the problem was described here in a recent meeting of the American Society of Mechanical Engineers. The speaker was L. J. Grunder, manager of fuels and lubricants development for Richfield Oil Corp., which is the pioneer in these low-gravity turbine fuels.

Use of low-ash residual fuel and additives have been two methods of coping with the corrosive effects of the ash on metal, he brought out. Calcium in soluble form is believed to be the least expensive method of overcoming the problem and is an ingredient in the approved fuel.

Some of the important specifications of this fuel, with regard to the vanadium corrosion problem, were given by him as being: (1) Ratio of sodium to vanadium, 0.3 (by weight); (2) ratio of calcium to vanadium, 5.0; and (3) ratio of calcium plus one-half nickel to vanadium, 6.0.

Other important specifications mentioned were: (4) The total ash must not exceed 0.2 per cent; (5) B.s. and w. not over 2.0 per cent; (6) sulfur not over 3.5 per cent; and (7) compatibility and stability must pass the N.B.T.L. heater test with a No. 2 tube or better.

Operating conditions . . . Regular diesel fuel is used to bring the turbines to normal operating temperatures, when controls are switched so that low-gravity fuel is burned.

At idling speed, the turbine requires 17,500,000 B.t.u. per hour, and under full load requires 84,000,000.

Under full-load conditions, two general types of corrosion occur, Grunder said. One is due to vanadium and is considered a surface phenomenon. The other is due to sodium in combination with sulfur which indicates depth penetration of the sulfide along the grain-structure boundaries. When Austenitic steels are employed, Grunder said, those highest in chromium showed the least vanadium or sulfide attack.

Corrosive ash deposits, he said, form on combustion tube surfaces, entry nozzles, and turbine buckets at all operating temperatures. They become corrosive to the nickel-chrome turbine blades at a critical temperature of about 1,100° F.

Only complete solution to the problem when using a residual fuel, Grunder declared, is the use of an additive to produce an ash having a melting point higher than that of the ash now being deposited in the turbines. General Electric Co., however, has concluded that calcium in soluble form is the least expensive method of overcoming the corrosive-ash situation, he said.

Socony-Vacuum Sued

Houdry wants damages for alleged patent infringement involved in licensing Air-Lift T.C.C. units since 1949

PHILADELPHIA.—A major suit alleging infringement of patents on the moving-bed catalytic cracking process, has been filed in Federal Court here by Houdry Process Corp. against Socony-Vacuum Oil Co., Inc. Houdry is seeking damages which company attorneys say might reach $21,700,000 plus treble damages for alleged willful and deliberate infringement of Houdry patents.

The suit arises from the licensing by Socony-Vacuum of the Air-Lift Thermofor catalytic cracking process in competition with Houdry's Houdriflow catalytic cracking process.

Both employ the moving-bed principle evolved in the original wartime T.C.C. process. Houdry contends that since 1949 Socony-Vacuum has unlawfully utilized, in licensing to others, Houdry's technological knowledge which had been disclosed to Socony-Vacuum to be used solely in its own refining operations.

Socony reply . . . In answer to the announcement of the suit, Austin T. Foster, Socony-Vacuum's general counsel said, "Socony-Vacuum will of course contest the suit by the Houdry Process Corp.

"I have not seen the complaint, but it appears the suit is an attempt by the Houdry Process Corp. to obtain title to important inventions developed in Socony-Vacuum laboratories. These inventions have been made available by Socony-Vacuum on fair and equitable terms for improvement of oil-refining processes throughout the free world.

"The complaint is apparently based on strained conclusions resulting from wishful thinking as to both the nature of the business relationships between Socony-Vacuum and Houdry and the question of whose laboratories did what. We are confident the court will find in our favor."

From the founding of the Houdry company in 1931 until 1947, Socony-Vacuum shared in the management and financial control of Houdry. After withdrawing from participation in Houdry's management Socony-Vacuum retained roughly a one-third interest, which it sold in August 1950.

Background . . . Houdry's complaint states that under conditions of limited right of use, Houdry transmitted to Socony-Vacuum a complete record of Houdry catalytic cracking technology as is currently practiced by Socony-Vacuum and others under license from Houdry. This knowledge, says Houdry, was divulged to Socony-Vacuum with the express limitation that it was only for use by Socony-Vacuum in its own refineries and those of its subsidiaries, and was not to be conveyed by Socony-Vacuum to others.

After withdrawing from Houdry management Houdry asserts, Socony-Vacuum in the summer of 1949 while still a stockholder in Houdry, announced to the petroleum industry its intention to license a catalytic cracking process which Houdry claims embodies patented and unpatented property that Houdry owns and which Houdry had granted Socony-Vacuum the right to use in its own operations on a royalty-free basis. In addition, the Houdry complaint asserts, when Socony-Vacuum began competing with Houdry, Socony-Vacuum adopted a royalty rate on their Air-Lift T.C.C. process which was 60 per cent below Houdry's rate.

Despite its numerous and repeated protests, Houdry contends, Socony-Vacuum has continued its licensing activities in an "unlawful and deliberate breach of the relationship of trust and confidence" between the parties, and claims that Socony-Vacuum's actions constitute an "unlawful appropriation by defendant of plaintiff's exclusive proprietary rights . . . in the field of catalytic cracking."

According to the complaint, Houdry bases its suit on (1) violation of trust and confidence, (2) breach of contract, and (3) patent infringement. In addition to the damages it seeks, Houdry is asking for an assignment of certain patents claimed to have been developed by Socony-Vacuum at Houdry's expense, as well as a perpetual injunction against Socony-Vacuum's acts involved in the controversy, and treble damages for patent infringement.

The processes . . . Houdry Process Corp. was organized in 1931 to market the original fixed-bed catalytic cracking process based on Eugene Houdry's invention. The first Houdry unit went on stream in 1936. In October 1938, Houdry and Socony-Vacuum made an agreement under which the latter would explore the possibility of developing a moving-bed catalytic cracking process employing the fundamental principles of the original fixed-bed process.

The result was the T.C.C. process, developed by Socony-Vacuum and introduced in 1942. Houdry states that it paid Socony-Vacuum $2,165,000 which it says more than covered all costs and expenses incurred by the latter in developing the process. As sole owner, Houdry licensed the T.C.C. process for several years to refineries throughout the world.

In 1948, Houdry announced the Houdriflow process, and the following year Socony-Vacuum offered the Air-Lift T.C.C. process for licensing. Both moving-bed processes superimpose the reactor above the regenerator or kiln. Spent catalyst flows by gravity from the reactor to the kiln, and each process raises the regenerated catalyst to a point above the reactor by pneumatic means.

Houdry has licensed a total of 16 Houdriflow units in eight United States refineries and four foreign plants in Canada, Germany, Belgium and Japan. Socony-Vacuum has licensed 40 Air-Lift T.C.C. units, including 25 in North America, 11 in Europe, and one each in South America, Africa, Asia and Australia.

Imports-Policy Meeting Set

WASHINGTON.—The Independent Petroleum Association of America will take to Congress its plea for a reduction in imports of foreign oil, Russell B. Brown, general counsel, told a press conference here March 4.

Brown said Congress will be given information "as to injury caused and relief needed" and he asked "all possible support from any and every citizen" in the campaign.

Brown also said the I.P.A.A.'s program to solve the imports problem will be developed at a meeting of its import-policy committee March 17.

Industry Briefs

CALGARY, Alta. — Three small British oil companies have revealed they will enter oil operations in western Canada in hopes of bolstering their dwindling crude supplies in South America. They are Anglo-Ecuadorean Oilfields, Inc., Lobitos Oilfields, Ltd., and Premier Consolidated Oilfields, Inc. Operations of these firms in the past have been conducted in Ecuador, Peru, and Trinadad.

BATON ROUGE. — The Louisiana Public Service Commission has petitioned the governor and the legislature of Louisiana to investigate whether some action should be taken to conserve the state's natural gas. The commission complains that it has no power over exports of gas from the state.

ST. LOUIS.—Mississippi River Fuel Corp. and Mathieson Chemical Corp. have formed a new petrochemical corporation, Mathieson Mississippi Co., to explore the possibility of developing chemical operations in the St. Louis area, using natural gas as a raw material.

EAST CHICAGO, Ind.—First deliveries of crude through Sinclair Pipe Line Co.'s 674-mile, 22-24-in. system from the Drumright-Cushing, Okla., area were received here March 5. Final weld marking completion of construction of the system was made March 3 near Dyer, Ind., 15 miles south of here.

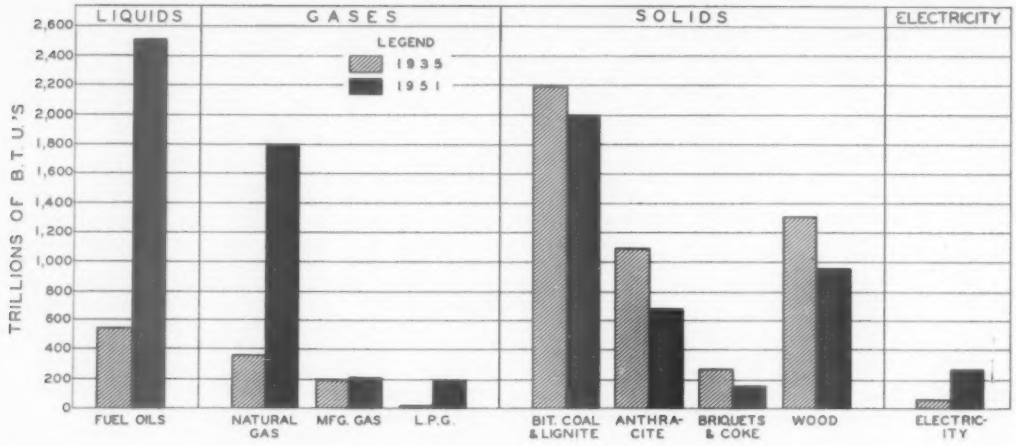
TAMPA, Fla. — Joseph G. Heyck, Tampa, has filed 20 oil leases on a total of more than 250,000 acres in Osceola, Indian River, Okeechobee, and St. Lucie counties, Florida, for a sum slightly in excess of $100,000.

NEW YORK. — McGraw-Hill Publishing Co. has purchased National Petroleum Publishing Co., W. C. Platt Co., and Platt's Price Service. National Petroleum publishes Petroleum Processing, a refining trade journal; National Petroleum News, oil-marketing magazine; and TBA Directory and Buyers' Guide. W. C. Platt Co. publishes Platt's Oilgram and Platt's Oil-Law-Gram, daily services. Platt's Price Service, Inc., publishes Platt's Oilgram Price Report, a daily service on petroleum marketing.

WICHITA.—The Kansas Corporation Commission has set the March crude production allowable for the state at 315,000 bbl. daily — 10,000 bbl. less than was permitted in February. The change was the first since December, when permissible production was set at 325,000 bbl. daily, down 5,000 bbl. daily from November.

OKLAHOMA CITY.—Allowable crude-oil production in Oklahoma during March has been set at 539,905 bbl. daily by the Oklahoma Corporation Commission. The same allowable now has been maintained for 4 months. It was first set in December.

SAN ANTONIO, Tex.—Sale of 521 acres of leases and 7 oil wells in Howell field of northeast Jim Wells County by H. H. Howell to Susan Peak Oil Co., Dallas, for $500,000 was reported here last week. Milton Bailey, manager of Howell, said that the 7 oil wells have a daily allowable of 326 bbl. A gas well in the Williman field also was included.



Petroleum Fuels Gain

Fuels oils, natural gas, L.P.G. supplied more than half of energy for space heating in 1951, Bureau report shows

PETROLEUM fuel oils, natural gas, and L.P.G. are outdistancing other sources of energy in the competition for residential and commercial space heating markets.

The petroleum fuels supplied slightly more than 50 per cent of the total energy for these uses in 1951, compared with 15.7 per cent in 1935, according to a compilation of statistics by the Bureau of Mines.

The increase in consumption of the petroleum fuels for residential and commercial heating in the 1935-1951 period was larger than the gain for all fuel and power, indicating that the total for all other fuels was less in 1951 than in 1935.

Most of the information contained in the tables of the report has been published as segments of other reports by the Bureau of Mines, American Gas Association, or other government agencies. The grouping of these pieces of information makes it possible to show growth in use of fuels for residential and commercial heating as well as the shifts toward certain types of fuel.

The study was intended to cover energy sources of residential and commercial heating, but since it was not possible to separate residential uses of gas and electricity to show totals for heating, cooking, and lighting, the tabulations include all residential uses of electricity and gas.

Liquid fuels, gas gaining . . . Liquid fuels accounted for only 9.6 per cent of fuel and power consumption for residential and commercial space heating in 1935. In 1951 these fuels moved up to supply 28.2 per cent of the energy load. This classification includes Grades 1, 2, 3, and 4 of distillate fuels; range oil and kerosine; and Grades 5 and 6 of residual fuel.

Natural gas had the largest relative gain of the major energy sources. Natural gas supplied 6.1 per cent of the energy for residential and commercial heating in 1935 and climbed to 20.2 per cent of the total in 1951.

L.P.G. had the greatest percentage gain, but even in 1951 it was a minor source of energy for space heating. The increase was from about 0.03 per cent of the total in 1935 to 2.3 per cent in 1951.

Solid fuels lose ground . . . The gains in use of liquid and gaseous fuels were at the expense of solid fuels. Residential and commercial consumption of bituminous coal, lignite, anthracite coal, coke, briquets, packaged fuel, and wood represented 80.1 per cent of total energy for these uses in 1935, but had dropped to 43.0 per cent by 1951.

Most of these solid energy materials decreased in total volume as well as in comparison with the grand total.

Residential and commercial use of bituminous coal and lignite decreased from 83,990,000 tons in 1935 to 76,531,000 tons in 1951. Anthracite use dropped from 42,200,000 tons to 27,844,000 tons. Consumption of wood, including mill waste, declined from an estimated 60,000,000 cords in 1935 to 46,632,000 cords in 1951.

Electricity use up . . . Sales of electricity for residential use and for commercial heating increased from 0.9 per cent of total energy for these uses in 1935 to 3.3 per cent in 1951.

The percentages are based on the physical state at point of consumption It was estimated by the bureau that out of electricity's 3.3 per cent of the total energy, 2.4 per cent was produced from fuel. The remainder was from hydroelectric power.

The bureau also added a table of total indicated consumption of mineral fuels for all uses in the United States with energy use in therms per capita.

PERCENTAGE CONSUMPTION*

Year	Liquid	Gaseous fuel	Solid fuel	Electricity
1935	9.6	9.4	80.1	0.9
1936	11.9	9.8	77.4	0.9
1937	14.1	10.3	74.5	1.1
1938	15.4	11.0	72.4	1.2
1939	16.5	11.0	71.2	1.3
1940	18.2	11.4	69.1	1.3
1941	18.1	11.1	69.5	1.3
1942	17.2	12.1	69.3	1.4
1943	15.1	12.1	71.4	1.4
1944	14.7	12.5	71.3	1.5
1945	16.1	15.5	68.8	1.6
1946	19.1	15.4	63.6	1.9
1947	22.4	17.6	57.9	2.1
1948	24.2	19.4	54.0	2.4
1949	23.8	21.1	52.3	2.8
1950	26.2	22.7	48.2	2.9
1951	28.2	25.5	43.0	3.3

*Fuel and power consumption for all residential uses and commercial space heating, according to physical state at point of consumption.

New Gas Line

Northwest Natural planning export of Alberta gas east

OTTAWA, Ont.—Representatives of Northwest Natural Gas Co. were conferring here last week with officials of Ontario and of this city in an effort to obtain backing for a big gas line, newly proposed by the company, from Alberta to eastern Canada.

This would place the company in the position of proposing export of Alberta gas to both the east and the west. It currently is seeking approval of the U. S. Federal Power Commission to carry gas to the Pacific Northwest states.

The plan which company officials are unveiling here calls for a line paralleling Interprovincial Pipe Line Co.'s extended system. It would extend south out of Alberta, enter the United States at Superior, Wis., and swing back into Canada at Sarnia.

Northwest Natural says it can build the line for about $50,000,000 less than the estimated cost of the Alberta-eastern Canada line planned by Trans Canada Pipe Line Co. It reportedly would sell the gas at 45 cents per M.c.f. —from 5 to 15 cents per M.c.f. cheaper than the 50 to 60 cents per M.c.f. estimated by Trans Canada. To make its bid for government approval still more attractive, Northwest says it would lay branch lines to the head of the lakes and to the Sudbury mining areas.

A. Faison Dixon, president of Northwest Natural Gas Co., told the Journal last week the new line is in the studying stage and said that it is being considered in addition to the western line and is not to be construed as a substitute.

Northwest Natural is backed by its original promoters, Brokaw, Dixon, and McKee, New York, and by Morgan-Stanley & Co., New York.

New Rules for Saskatchewan

REGINA, Sask. — New regulations covering drilling, production, safety measures, and plugging and abandoning of oil and gas wells have been passed under the Oil and Gas Conservation Act of Saskatchewan.

J. H. Brockelbank, minister of natural resources, said the new regulations became effective February 14. They replace the old rules in force under the Oil and Gas Wells Act.

The new regulations are the result of 14 months of study, Brockelbank said. A preliminary draft, patterned after similar regulations in effect in Alberta and the United States, was presented to representatives of the oil industry in the province for suggestions and revisions prior to its adoption.

The rules are obtainable in gazette form. They were printed in Volume 49, No. 7, The Saskatchewan Gazette, February 14, 1953.

Sarnia Expansion Announced

SARNIA, Ont.—A $6,000,000 construction program for Imperial Oil, Ltd.'s refinery here has been announced by Dr. J. L. Huggett, general superintendent.

The program includes a new quality control laboratory, a mechanized packaging and shipping plant and centralized mechanical shops.

Expansion of these auxiliary facilities was required by the recent $14,000,000 construction program, which is adding Canada's largest catalytic cracking unit and atmospheric and vacuum crude distillation unit. Total capacity of the refinery is being expanded from 55,500 to 75,000 bbl. per day.

Bonnyville Plant on Stream

BONNYVILLE, Alta.—A 1,000-bbl. topping plant which will process crude from the Bonnyville-Cold Lake area near here has been placed on stream by Bonnyville Oil Refineries.

Thomas E. Dubuc, president of Tri-Tor Oils, Ltd., which holds a half interest in the refining company (the remaining half interest held by Tor American Oils), said the capacity of the refinery will be doubled by mid-1953 to handle the increasing production. Bonnyville field was discovered in July 1951. The area now has 15 producing oil wells.

First Lube Plant Planned

EDMONTON.—Plans for the first lubricating-oil plant to be built in western Canada, are being pushed by Imperial Oil, Ltd., at its 22,600-bbl. per day refinery here.

According to H. H. Moor, superintendent at Edmonton, the project will cost an estimated $10 million and will have a productive capacity of about 2,000 bbl. per day of automotive and industrial lube oils. The Edmonton plant will be Canada's second largest, exceeded only by Imperial's Sarnia operation.

The new lube plant will include a solvent extraction unit, a solvent dewaxing unit, and facilities for finishing and packaging lubes. The refinery's laboratory facilities will be expanded to include the necessary control testing equipment for the new operation. Selected Alberta crudes will be used for the lube manufacture. About 110 different products are anticipated, all of which are now imported into the area.

Construction is expected to begin early in 1954 and the program calls for initial operation by mid-1955.

Oil Rights Lost

Court upsets Manitoba's claim on 1,400,000 acres

WINNIPEG, Man. — The Court of Appeals of Manitoba has upheld the judgment of a lower court denying title to Manitoba on oil rights on 1,400,000 acres of land.

Some of the land is in Daly field near Virden. About 250,000 acres is part of the land subsidy given more than 50 years ago to the Manitoba and Northwestern Railway. Bonds of the railway firm were guaranteed by the province. Later the railway defaulted on the bonds, and the province paid them. The land then was conveyed to the province by the Canadian Government as part compensation for the loss. The rest of the land principally is swamp.

Relying on a former provincial lands act which said that unless mineral rights were specifically included in a conveyance they would remain with the province, the Manitoba government issued title to a section of the land to a purchaser. This purchaser resold it to William Hiebert, a farmer near Portage la Prairie. The conveyance did not except mineral rights, and Hiebert assumed he owned them. The dispute began when Hiebert leased oil rights on the land to Canadian Superior Oil Co. of California, and the lands title office in Portage refused to register the lease on the grounds that the province was the legal owner of the oil rights.

The company took the case to court and won the initial decision which now has been upheld by the appeals court. Permission to appeal the decision to the Supreme Court of Canada is being sought by the province. It is thought it will be granted on the condition that the province defray all costs.

No estimate of the value of the rights involved is available. It is thought that several companies will begin exploration and drilling works on the lands. Activity was held up pending decision by the appeals court.

New Technique Proved

High-pressure gas injection in Block 31 field recovering up to 52 per cent of oil in place, Atlantic data reveals

Roy F. Carlson

FORT WORTH.—High-pressure gas injection is recovering up to 52 per cent of the oil in place in the Block 31 experiment of Atlantic Refining Co.

And the experiment has disclosed the fundamental fact that the efficiency of high-pressure injection depends on whether the gas is miscible or immiscible with the reservoir fluid.

This was explained at the spring meeting of the American Petroleum Institute's Southwest district here March 4-6 by Dr. R. L. Slobod and Dr. Howard A. Koch, Jr., both of Atlantic's production-research department in Dallas.

Atlantic's new high-pressure oil-recovery method has been regarded as one of the hottest developments to come out of production-research laboratories ever since it was first announced *(The Oil and Gas Journal, June 30, 1952).*

A practical application of the method is now operating in University Block 31 field in Crane County, West Texas, and the Slobod-Koch paper revealed much new data on this test.

Miscibility important . . . The mechanics of high-pressure injection are different under two different sets of conditions, which Atlantic calls the immiscible zone and the miscible zone. Use of the word "zone" in this connection does not connote a horizon or area, but rather a set of physical characteristics within the reservoir during the gas sweep.

The recovery of 52 per cent of the oil in Block 31 was achieved by operating in the "M-Zone," or under miscible conditions. In this test it was calculated that the gas sweep affected 58 per cent of the volume of the reservoir, and was ultimately effective in displacing 90 per cent of the quantity of oil touched by the sweep. This resulted in actual production of 52 per cent of the total oil originally in the reservoir.

Factors affecting recovery . . . The important factors affecting recovery when using high-pressure gas are:

. . . Enrichment of injection gas by evaporation of intermediates into the gas phase.

. . . Solution of enriched gas in oil to increase volume of oil phase in the reservoir.

. . . Reduction in difference of viscosity between injected gas and reservoir oil.

. . . Trend toward complete miscibility at the front between enriched gas and swelled reservoir oil.

The two basic actions resulting from these factors are:

1. Improving of the interfacial viscosity ratio.

2. Swelling of the reservoir oil as a result of solution of enriched injected gas.

Under favorable conditions the enriched-gas phase may become miscible with the diluted reservoir oil at the front. This miscibility is extremely important in high-pressure gas injection. When gas is injected into a reservoir at high pressures, something more than a mere pushing out of the oil occurs. An exchange of hydrocarbon components between the gas and oil takes place. This modifies the properties of both.

The intermediate hydrocarbons (largely C_2 through C_6) are the main materials involved. In this exchange, the transfer works in the direction of making the gas and oil which are in contact more alike. This results in a more efficient displacement. In the extreme, when the displacing phase is enriched to such an extent that it becomes miscible with the reservoir oil, the oil is essentially washed out of the reservoir.

Under immiscible conditions (I-Zone), the enriched displacing gas is immiscible with the reservoir oil and does not dissolve. The process gas is similar to a low-pressure gas displacement except that a more favorable displacement of oil is possible, that is, displacing gas is more viscous with respect to the oil and the undersaturated oil in contact with the gas is swelled.

Under miscible conditions (M-Zone), the displacing gas becomes so enriched that the richest gas at the front is miscible with the reservoir oil. The reservoir oil must be undersaturated with respect to the injection pressure for this phenomenon to occur. When the displacement process becomes so miscible and hence similar to that of oil by gasoline (as in a pipe line), nearly all of the oil in the pore spaces contacted by the displacing phase is displaced.

In discussing the importance of miscibility, Slobod and Koch quoted Dr. Morris Muskat, of Gulf Oil Corp., who previously emphasized the relationship between miscibility and high recovery *(The Oil and Gas Journal, September 22, 1952, page 79).* Dr. Muskat said the controlling physical factors limiting oil recovery today are immiscibility between the displacing and displaced fluid phases in a reservoir and the associated interfacial forces. If these limiting factors were removed, Dr. Muskat said, substantially 100 per cent recovery of oil might be achieved.

Unitization Problem

Methods of calculating unit participation given A.P.I.

FORT WORTH.—An analysis of the different methods of calculated participation in unit agreements was detailed here last week by E. B. Miller, Jr., chief petroleum engineer for Tide Water Associated Oil Co., Houston.

Addressing the spring meeting of the southwestern district of the American Petroleum Institute's Division of Production, Miller said the recent trend in selecting participation formulas is to include some factor which represents the amount of oil, gas, and condensate in place under each tract in the unit area.

Pay volume, expressed as acre-feet, is commonly used as representing the amount of these products in place. Many variations or modifications of the straight acre-foot determination have been employed, such as net acre-feet of pay, gross acre-feet of pay, or adjusted acre-feet.

Where it is possible to differentiate accurately between productive and nonproductive portions of the zone, Miller said, the net acre-foot determinations are generally used. However, when this is not possible, the thickness of the total zone is used to determine the gross acre-feet.

In two-phase reservoirs it is necessary to establish some relationship between the oil and gas phases of the reservoir. Miller said one method is to establish values per acre-foot for oil and for gas and then multiply the oil acre-feet by an amount which would adjust it to the value of the gas acre-foot. The resultant value is called adjusted acre-feet.

To establish relative values between an acre-foot of oil sand and an acre-

foot of gas sand requires that recovery factors must be established for each and that a dollar value for the oil, gas, and condensate must be determined.

Reserve factor . . . A number of the participation formulas include a reserve or recoverable-oil factor, which is essentially the same as using acre-feet as long as uniform recovery per acre-foot values are used. Inasmuch as there are comparatively new fields which have an oil-in-place or an acre-foot factor in the proration formulas, there are few cases where the current rate of production is in proportion to the reserves. This is especially true of oil reservoirs.

The Tide Water engineer noted it is obvious that if only the amount of oil in place, as indicated by either reserves or acre-feet, is the only factor in the participation formulas there will be readjustment in current income in proportion to the variation of oil in place under the various tracts in the unit. It is for this reason that many of the formulas include other factors which will tend to modify this adjustment, he added.

Drilling Developments

New mud for high-temperature formations, advantages of bentonite in cementing outlined at Fort Worth meeting

FORT WORTH. — Procedures for coping with lost-circulation problems, the advantages of bentonite in oil-well cement, and a drilling fluid for use in drilling high-temperature formations were described here at the March 4-6 meeting of the southwestern district of the American Petroleum Institute's Division of Production.

The high-temperature-formation drilling mud was described by T. E. Watkins, Magnolia Petroleum Co., Dallas, who outlined field tests using what appeared to be optimum formulations of each of three types of mud systems—low-pH red mud, lime-base mud, and lime-treated mud.

Results of these field tests, he said, indicate that for drilling in high-temperature formations, especially for exploratory drilling where logging data are of vital importance, this procedure is best:

"Drill with the conventional mud program to the depth where the mud density must be increased to a high value, then replace the entire mud system (which probably contains a large quantity of light solids) with a system of the composition shown in the accompanying table.

"It should be noted that replacement of the mud system at a moderately low density will avoid discarding the large quantity of weighting material which would be necessary should the replacement be postponed until the mud density becomes substantially higher."

Typical Composition of Mud System to Be Used in Drilling High-Temperature Formations

5 lb. per bbl. high-grade bentonite
1 lb. per bbl. caustic soda
2 lb. per bbl. quebracho
2 lb. per bbl. lignitic emulsion stabilizer
1 lb. per bbl. CMC, polyacrylonitrile, or similarly stable organic water-loss reducing material
Barite to yield the desired weight
10 volume per cent diesel oil
Lime—add when necessary to maintain a pH of 10.5 to 12.0

Note: The order of addition should be from top to bottom as listed. Higher concentrations of bentonite may be necessary in lower-density muds.

Lost circulation . . . J. M. Bugbee, Shell Oil Co., Houston, explained why this is a major problem in exploration and development drilling. Bugbee summarized these available procedures for dealing with lost circulation:

. . . Conduct drilling practices or mud systems in a direction to lower the pressures on the formations.

. . . Adopt such methods as drilling blind, with or without a floating mud cap; drilling under pressure with the well flowing; or drilling with air.

. . . Use waiting periods. Pull the drill pipe into the casing and allow well to stand while the formations, or the formation blocks, adjust themselves to withstand the new pressure conditions.

. . . Place a soft plug — batches of mud thickened with fiber and flake materials—in the loss zone. There is a decided trend away from circulating these materials and to the practice of spotting them in batches as plugs.

. . . Place bridging-particle plug— batches of mud loaded with gravel, expanded perlite, ground plastic, walnut shells, or formation cuttings—in the loss zone. If possible, apply some squeeze pressure.

. . . Place plugs that harden or stiffen in the loss zone. Such plugs include gel cement, gypsum cement, oil-base mud, oil-bentonite, and time-setting clay.

Bentonite in cements . . . In their paper on this subject, B. E. Morgan and G. K. Dumbauld, Humble Oil & Refining Co., Houston, said laboratory and field experience show that cements containing 8 to 12 per cent bentonite are advantageous in cementing when they have these properties: (1) low slurry density of 12.5 to 14 lb. per gal.; (2) low water loss of about 100 cc. in a 30-min. A.P.I. filtration test; and (3) low set strength of about 200 to 250 psi. tensile.

A saving of about 15 to 25 per cent in the cost of cementing materials for a given job is realized, said Morgan and Dumbauld, through the use of cements containing 8 to 12 per cent bentonite in preference to cements containing no bentonite. An additional saving is realized in many areas because the time and expense of performing stage jobs are eliminated by the use of light-weight slurries prepared with cements containing 8 to 12 per cent bentonite.

Management training . . . Frank H. Willibrand, Sohio Petroleum Co., told the A.P.I. audience that the oil industry is beginning to give earnest attention to the development of supervisory and managerial skills.

The art of management is just now evolving, he said, and the importance of the human relationship within and without an organization is being better understood and accepted.

Technologically, he said, we have come a long way in improving the economics of our business but have not kept pace in developing skills which make it easier for people to work together harmoniously.

Training of most engineers, Willibrand said, has made almost no contribution to human relations skills such as reliability, composure, self-assurance, loyalty, ability to delegate authority, humility, patience, and intellectual honesty.

Gas-oil ratios . . . Ratios in thin oil columns can be controlled by regulation of fluid saturations in the sand, and this saturation control can be best achieved on a reservoir basis through unitization.

This was the conclusion of a paper presented by Robert C. Randle and Jacques H. Marchal, of Magnolia Petroleum Co.

Until unitization can be accomplished, they said, gas-oil ratios must be controlled in individual wells through variation of choke sizes and intermitters which will help minimize the differential pressure through the reservoir and thus reduce the gas-oil ratio.

West Coast line . . . The desire of many West Texas independent producers for a larger market for their

crude, together with a shortage of crude in the Los Angeles Basin, provided the inspiration which led to the planning of the projected West Coast pipe line, Burt Hull, director and vice president of West Coast Pipe Line Co., said.

Rapid population increases in California afford an ample market for products, Hull said, adding that the proposed line would make crude available at a lower price than that of imported crude from either the Pacific Northwest or the Gulf Coast.

THESE MEN were instrumental in the planning and programing of the Permian basin regional meeting of the Natural Gasoline Association of America. They are S. M. Sisley, Shell Oil Corp., Midland, head of the program committee; Malcolm Duncan, Johns-Manville Corp., Tulsa, head of the Natural Gasoline Supply Men's Association; William F. Lowe, N.G.A.A. executive secretary from Tulsa; J. M. Sappington, Barnhart Hydrocarbon Co., Big Lake, Tex., member of the program committee; E. D. Dickey, Shell Oil Co., Midland, toastmaster at the evening banquet; W. C. Ford, Houston consultant, one of the principal speakers; and W. J. Rogers, Magnolia Petroleum Co., Dallas, also a speaker.

Secret of Safety

Instilling desire to work safely in employe is big factor in making plant program successful, Rogers tells N.G.A.A.

Roy F. Carlson

MIDLAND, Tex.—Motivation is the big factor in making a plant safety program work, according to W. J. Rogers, Magnolia Petroleum Co.

Speaking at the third annual Permian basin regional meeting of the Natural Gasoline Association of America February 27, Rogers said supervisors in the plant are directly responsible for instilling in employes the desire to work safely.

The supervisor, he said, must analyze each job and the man doing it and achieve a closer relationship to the worker than is common at present.

The supervisor's attitude and interest in employes will do more to make a safety program work than will all the tricks and training that can be used.

An industrial relations consultant, W. C. Ford, told the gasoline men that to evaluate employes and their jobs properly, management should consider the organization, the positions in that organization, and the employes themselves. Then, in developing a "yardstick" for employe promotion it must consider the employe's intelligence, emotional stability, skill in human relations, ability to organize, direct, and control, and readiness for promotion. Lack of ability accounts for 10 to 15 per cent of job failures, and lack of emotional stability and maturity accounts for 75 to 85 per cent of the failures.

Management further, Ford said, must be willing to adapt its organization to the personnel available and to changing conditions, make use of every available tool for employe appraisal, and furnish opportunities for employes' emotional, technical, and intellectual growth.

Destructive forces in pumps . . . F. B. Applegate, Pacific Pumps, Inc., described the destructive forces in centrifugal pumps as being erosion, chemical attack, and motion. In order to establish a preventive-maintenance program, seven factors must be considered, he said, these being design, materials, and workmanship in the pump, selection, and location of the pump with its attendant piping, proper installation and cleanliness, and training of operators in proper operating and repair techniques.

W. R. Crooks, Cooper-Bessemer Corp., described experiments and developments in supercharging of gas and diesel engines. Supercharging of these engines, which just became economically justifiable in 1948, permits increased engine ratings of a given engine, making possible direct savings in foundation and engine costs. Other benefits, he said, include a lower specific fuel consumption, improved combustion characteristics, lower heat load on cylinder parts, and elimination of derating for high ambient temperatures.

Field Opening Delayed

AUSTIN.—Reopening of Fort Chadbourne field of Coke and Runnels counties has been delayed further by a difference of opinion among operators on plans for disposal of produced gas.

The Texas Railroad Commission recessed a hearing on an application of N. P. Powell, C. H. Wylie, and Curry & Wylie for reopening of the field to allow operators time to agree on a specific plan.

Fort Chadbourne was shut in by the commission on February 1, 1952, because of excessive flaring of gas. At that time there were 229 producing wells with an aggregate allowable of 16,250 bbl. daily. The commission said 11,000,000 cu. ft. of wet gas was being flared daily.

Since then Lone Star Gas Co. has built a processing plant capable of handling 30,000,000 cu. ft. per day, extracting the liquids and boosting the gas to a pressure of 2,500 psi. for injection.

The applicants asked that the field be reopened as soon as these facilities were ready for operation. Humble and others objected, arguing that it should not be reopened until field rules were changed to fit a program of gas injection. Considerable work has been done toward unitizing the field, a move favored by the major companies operating there.

World Field Wells Sold

OZONA, Tex.—Cliff Thomas, San Angelo, Tex., L. F. Oil Co., and W. Stewart Boyle, Houston, have purchased 34 wells pumping a total of about 900 bbl. of oil daily in World field of Crockett County, West Texas, from the Armer interests of Fort Worth and Wichita.

Purchase price was $1,500,000. World field was discovered in 1925. The discovery well, L. H. Armer 1-A Powell, was included in the deal. It now is producing about 28 bbl. daily.

According to Thomas, the new owners have no plans at present for further development except to take care of offsets.

WEST COAST

Pilot Flood Near

Long Beach to ask bids on Wilmington field project

LONG BEACH.—Long Beach Harbor Department shortly will ask bids for drilling a water-injection well and constructing a treating plant for a 5,000-bbl.-daily pilot-injection program on city of Long Beach properties in Wilmington field.

These initial facilities are expected to lead to a huge program for the entire southeastern end of the field, involving the injection of more than 300,000 bbl. of brine daily. It would have the dual purpose of increasing oil recovery to at least equal that anticipated under primary recovery and of checking land subsidence resulting from fluid and gas withdrawals.

The pilot flood will be initiated in a sub pool of the Upper Terminal zone in Fault-Block 5-B where Long Beach Oil Development Co. acts as contractor for the city. Brine injection through a well on the north flank is expected to be started in May. It is estimated at least 500,000 bbl. of additional oil will be recovered from the 37-acre pool.

Dodge report . . . The Harbor Board on March 2 received a report by Dr. John Dodge on flooding possibilities of Block 4. Dodge, who has been making a block-by-block study of the field for the past year, recommended an 88,000-bbl.-daily input program for city properties in that area which amount to about one-half of the total in the fault block. This volume, he stated, would result in pressure decline and resulting land subsidence being checked. It would result also in an added oil recovery of about 71,000,000 bbl.

The plan calls for 16 injection wells, which, with the water-treating facilities, he estimated would cost $1,500,000. The wells would inject 10,000 bbl. daily in the Tar zone, 20,000 bbl. into the Ranger, 18,000 in the Upper Terminal, and 40,000 bbl. daily in the Lower Terminal.

Sunset Interest Purchased

LOS ANGELES.—Great American Oil Co., Chicago, has purchased a substantial interest in Sunset Oil Co., a pioneer West Coast independent oil firm.

Sunset engages in producing and refining operations and distributes and retails petroleum products marketed under the Golden Eagle brand. The transaction was revealed in a joint announcement by J. D. Sterling, president of Sunset, and by Great American's president, Barney L. Majewski, whose election to the Sunset board of directors also was disclosed in the announcement.

Conoco Lease Purchased

LOS ANGELES. — Richfield Oil Corp. has purchased Continental Oil Co.'s one-half interest in 670 acres of leases in the Castaic Hills area of Honor Rancho field, Los Angeles County.

The properties included seven wells currently producing about 1,000 bbl. daily. They were owned jointly by Continental and Trousdale & Sterling, discoverers of the Sterling pool. Richfield already had 11 wells on adjoining acreage which were producing about 2,000 bbl. daily.

Alaska Leases Acquired

LOS ANGELES. — R. T. Colter, California independent oil operator, has acquired a block of leases in Alaska totaling 75,000 acres, located approximately 30 miles north of Anchorage.

The leases were obtained from Tucker & Peterson, Anchorage, which had acquired them from the federal Government.

A. E. Zeller, geologist for Colter, will leave soon for Alaska to start exploration work. Three core holes have been drilled on the properties, all of which reportedly encountered natural gas above 1,300 ft. It is anticipated the geologic work will be completed sufficiently early for at least one wildcat to be started this year.

Structure Found Off L. A.

LOS ANGELES.—Los Angeles Harbor which has profited but little from Wilmington oil field, while its sister port of Long Beach has become wealthy may have a field all to itself in the outer harbor.

The structure is there, W. H. Geis told the Los Angeles Board of Harbor Commissioners on March 4 in making a geologic and oil prospects report he has been preparing for the past 8 months.

Geis, Los Angeles consultant retained by the commission to make the survey, recommended the anticline be tested by a well slant-drilled from an upland location. He placed the crest of the structure near the Los Angeles Harbor breakwater entrance about 1¼ miles east of upland and 1 mile southeast of the harbor area. The structure may be part of the Los Angeles basin or Catalina Island province, he said, but in either case it was not related to that of Wilmington or any other field in the general area.

The prospects of oil, Geis believed, are sufficiently attractive to lead a prudent operator or company to consider exploring the area "if the terms under which exploration is conducted are the usual ones accepted by the industry."

Before any well is drilled, however, he recommended a geophysical study be made both inside and out of the breakwater.

GULF COAST

Pipe-Line Tax Held Invalid

JACKSON, Miss. — Mississippi has no authority to levy a privilege tax on interstate pipe-line companies, the state Supreme Court ruled last week. Its decision reversed an earlier decision by the court.

Previously the court had held by a 5 to 4 vote that the tax was valid; the new ruling also was by a 5 to 4 decision and came after Associate Justice Fred Lotterhos replaced the late Associate Justice Julian P. Alexander. Lotterhos sided with the earlier minority which held the tax invalid.

In question was a 1952 legislative act levying a tax of $75 a mile on pipe lines from 20 to 26 in. in diameter crossing Mississippi as a privilege for "enjoying the protection of the government and laws of this state."

The majority in this latest decision held that the state may not exact a privilege tax from a person or corporation engaged so'ely in interstate commerce.

Atty. Gen. J. P. Coleman said the case will be appealed to the U. S. Supreme Court.

Rancho Line Delivers Crude

HOUSTON.—First crude oil to flow through the new Rancho pipe line from West Texas was scheduled for delivery here over the week end.

Arrival of the first crude marks completion of the $35,000,000 24-in. line which will move initially 210,000 bbl. daily over the 457-mile route from McCamey, Tex.

The Rancho line is owned by Shell Pipe Line Corp., Sinclair Pipe Line Co., Pan American Pipe Line Co., Crown-Rancho Pipe Line Corp., Nantucket Pipe Line Co., Phillips Pipe Line Co., and Ashland Pipe Line Co. The line was built and will be operated by Shell.

Test Case Resumed

Oklahoma commission to rule soon on whether it can set a minimum price on gas produced with oil in Ringwood field

OKLAHOMA CITY.—Hearings were resumed before the Oklahoma Corporation Commission last week on the first case to determine whether a state regulatory body has the authority to set minimum well-head prices for gas produced in an oil field.

The commission was petitioned late last year by royalty owners W. D. Greenshields and Stanley Coppock to set a minimum price of 10 cents per M.c.f. for casinghead gas produced in Ringwood field, Major County, Oklahoma. The average price now being paid in the field is about 2.75 cents per M.c.f. The gas is purchased by Warren Petroleum Corp. and processed in the $4,500,000 Ringwood natural-gasoline p'ant owned jointly by Warren and Oklahoma Natural Gas Co. Residue gas is sold to Oklahoma Natural for 10 cents per M.c.f. The Ringwood plant is in its first year of operation.

Though the commission twice has set minimum well-head prices for dry gas in Guymon-Hugoton gas field in the western portion of the state, this is the first time it, or any other regulatory body, has ever been called upon to set a price on gas produced with oil.

Warren and Oklahoma Natural opposing the price hike, contend the commission lacks the authority to take such action. The commission said it would consider this contention after testimony for and against the price hike is completed.

"Salvage operation" . . . The two companies say that gathering and processing of Ringwood gas is a "salvage" operation, since more than 19,000,000,000 cu. ft. was flared before the plant started initial operations in April 1952. If the proposed price increase were approved, they say, the plant would be uneconomical and would have to be shut down.

B. R. Carney, gas department, manager for Warren, told the commission that the price presently paid for the gas is based on sale of the residue gas and of the liquid hydrocarbons. The latter, he said, are sold in a competitive market, and the company has no control over such prices. The plant would never have been built, Carney said, if it had been known that the price of gas might be increased.

As proof of its a'legations that operation of the plant would be economically unfeasible with the price increase, the company offered at the hearing to sell the plant at cost less depreciation, to anyone who would buy it.

Further, witnesses for the companies stated, the proposed price hike would discourage other operators from investing in gasoline plants in Oklahoma.

The Warren position was endorsed by testimony of officials of two oil companies not involved in the hearing. E. C. Manning, central region superintendent of natural gasoline and gas operations for Continental Oil Co., told the commission that Continental twice had considered building a plant in Ringwood fie'd. The company did not think the project economically feasible, based on a program paying the producer 2 to 3 cents per M.c.f. of gas and selling the residue at 7 cents per M.c.f. George Bunn, manager of the gasoline department of Phillips Petroleum Co., said his company also had looked at Ringwood as a possible site for a plant but decided against it because of the "questionable reserve."

Witnesses for Warren and Oklahoma Natural were expected to complete their testimony by last week end. Evidence in support of the price boost was heard before the hearings were recessed in January.

Directors of Corrosion Short Course

Instructors and members of the planning committee are shown here attending the Fourth Annual Tulsa Short Course for Practical Control of Pipe-Line Corrosion, held March 4-6. The course is sponsored by the Tulsa section of the National Association of Corrosion Engineers. Standing, left to right, are T. M. Ragland, Phillips Petroleum Co., Bartlesville; Jim Bell, Service Pipe Line Co., Tulsa; T. L. Canfield, Consolidated Gas Utilities Corp., Oklahoma City; Marshall Parker, Cormit Engineering Co., Houston; Lancy F. Heverly, Great Lakes Pipe Line Co., Kansas City; Mel Maddox, Pittsburgh Coke & Chemical Co., Tulsa; and Jack P. Barrett, Stanolind Oil & Gas Co., Tulsa, chairman of Tulsa section. Seated are: Karl Feldman, Sinclair Pipe Line Co., and W. A. Hutchison, Sinclair Pipe Line Co., chairman of planning committee, both of Independence, Kans.; Yale W. Titterington, Pipe Line Anode Corp., Tulsa; and Frantz M. Hieronymus, Barrett Division, Allied Chemical & Dye Corp., Tulsa.

Healdton Field Floodable

WASHINGTON.—As much as 100,000,000 bbl. of oil might be recovered in Healdton oil field in Carter County, Oklahoma, by water flooding, in the view of engineers of the Bureau of Mines.

The estimate of possible secondary recovery was based on an engineering study of the field which indicated that only a small percentage of the more than 200,000,000 bbl. of oil still in the Healdton sands will be recoverable by present operating methods.

Water injections through specially equipped and properly spaced in-put wells would make possible the recovery of maybe half of the remaining oil, it was held in Report of Investigations 4917, copies of which are available without cost from the bureau's publication distribution section in Pittsburgh.

Since its discovery in 1913, the Hea'dton field has produced over 200,000,000 bbl. of oil from about 2,600 wells covering an area of 7,142 acres. The richest producing beds are the Healdton sands, averaging 72 ft. in thickness at depths between 700 and 1,400 ft.

Tidelands Proposal

Brownell suggests substitute for quitclaim bill; would give states oil-development job without title to lands

Bertram F. Linz

WASHINGTON. — Return to the coastal states only of such authority as required for administration and development of natural resources in the submerged areas within their historic boundaries was recommended last week by Atty. Gen. Herbert E. Brownell to avoid constitutional points which might be raised against quitclaim legislation.

Brownell addressed the Senate Interior Affairs Committee as it sought to bring its tidelands hearings to a close so that legislation could be sent to the floor of the Senate this week or next.

He said he had no doubt of the constitutionality of quitclaim legislation but suggested that prolonged court proceedings might be avoided by taking the course he outlined.

Brownell's suggestion appeared acceptable to the senators from California, Texas, and Louisiana, but his companion recommendation that specific authorization be given the Government to develop Continental Shelf lands beyond the state limits with the income going into the Treasury brought opposition from Sen. Price Daniel of Texas, who is seeking a 37½ per cent cut of the revenue for the states.

The recommendations . . . Brownell also recommended that the legislation should include a map showing the actual line dividing the state and federal areas in the Continental Shelf, rather than merely referring to historic boundaries or attempting to describe a line based on characteristics of the coast. Such a map, he said, would avert unnecessary litigation.

Other recommendations from the Department of Justice called for a clear statement that the submerged lands now under inland waters, including the Great Lakes, are the property of the states and that the federal Government makes no claim to them, and a provision to make certain that all installations by the states within their boundaries belong to them and all installations and acquisitions of the federal Government in such areas belong to it.

Brownell told the committee that wide latitude should be allowed the Secretary of the Interior or other designated official to develop the Continental Shelf "in the best interest of the country generally" to reduce the controversies and litigation that might otherwise result.

The Attorney General said, however, that the Interior Department should be the administering agency. He emphasized that persons who in the past have obtained state leases in good faith should be protected, and said the entire submerged lands issue should be handled in one act "so that the long stalemate may be ended and the exploration and development of the mineral resources of the Continental Shelf may again go forward."

Brownell's final recommendation was that no reservation be incorporated in the act on behalf of claimants under the Mineral Leasing Act, who the Department of Justice has consistently held have no standing in law.

Many of the applications for offshore leases have been based on scrip issued by the Government 45 to 100 years ago, entitling the holders to grants of public lands. This scrip has raised a problem to which Congress has turned its attention, and the House last week passed a bill giving holders 3 years in which to record their claims with the Interior Department and invalidating scrip not recorded within that period.

Avgas Forecast

Civilian demand gain of 60 per cent in 10 years seen

WASHINGTON. — Consumption of civilian aviation gasoline in the United States will increase by 60 per cent or more in the next 10 years, it was forecast last week by the Petro'eum Administration for Defense.

By 1955, PAD said in a long-range study of aviation-gasoline demand, domestic civilian aircraft gasoline requirements will be more than 30 per cent above the 1952 consumption. The study did not cover future aviation-gasoline demand by U. S. military aircraft, but was on an assumption that present economic conditions will continue and there will be no all-out war.

While the study of domestic requirements was confined to the civilian market, PAD covered both civilian and mi'itary aircraft in its estimate that foreign aviation gasoline consumption will increase 19 per cent by 1955 and 28 per cent by 1962.

The domestic civilian consumption of 21,400,000 bbl. in 1952 is seen as increasing to 28,200,000 bbl. in 1955 and 34,500,000 bbl. in 1963. Total foreign consumption, 27,600,000 bbl. last year, is estimated at 32,850,000 bbl. by 1955 and 35,400,000 bbl. in 1962.

Forecast by grades . . . The study indicates that civilian aircraft will use less gasoline of grades under 100 octane over the next 10 years and more of grades above 100/130. Consumption of the latter, 2,300,000 bb¹. in 1952, will triple by 1955 and increase another 40 per cent by 1962 to more than 12,000,000 bbl., while consumption of grade 100/130, which was nearly 15,300,000 bbl. last year, will rise only 18 per cent by 1955 and 27 per cent by 1962 to 19,400,000 bbl.

Foreign consumption of aviation fuels above 100/130 octane is expected to almost double, rising from 1,500,000 bbl. in 1952 to 4,700,000 bbl. in 1962. Demand for gasoline under 100 octane will remain steady at about 4,000,000 bbl. a year over the next decade, but demand for grade 100/130 is expected to increase from 22,100,000 bbl. last year to 26,600,000 bbl. in 1962.

End to Import Tax Urged

WASHINGTON.—Repeal of the import excise tax on foreign petroleum was recommended to President Eisenhower last week by the public advisory board for mutual security.

If imports reach a level where they impede domestic exploration and development "other measures" should be taken to assure a domestic industry adequate to defense needs, the board asserted in a 119-page report on trade and tariff policy.

The whole report was a thesis for free trade, and was considerably at odds with the administration's announced policy of expanding international trade to the maximum but with due protection to domestic industry.

The board recommended that decisions on trade policy be based on "national interest" and in cases where choice must be made between injury to the national interest and hardship to an industry the industry be he¹ped to make adjustments by such means as extension of unemployment insurance, assistance in retraining workers, diversification of production and conversion to other lines.

War-Needs Study

NPC to determine wartime requirements of industry

WASHINGTON. — A study of the minimum wartime requirements of manpower, equipment and materials for all phases of oil and gas exploration and development will be made for the Government by a National Petroleum Council committee.

A request for the study, which will cover geological and geophysical requirements, leasing, exploratory drilling, development, producing and services such as well logging, cementing, gun perforating, drilling mud, etc., was requested by the Petroleum Administration for Defense and approved by the council at its first 1953 meeting February 27.

In asking for the information, Deputy Administrator J. Ed Warren pointed out that in the event of war the continuous drilling of a substantial number of wells would be required year by year throughout the war period.

"Obviously," Warren said, "to drill a substantial number of wells year by year the petroleum industry must be assured of minimum requirements of manpower, equipment and materials."

In an informal talk with the council, Interior Secretary Douglas McKay indicated the present government-industry cooperative setup will be retained under the new administration. McKay said its work with PAD is a fine example of the type of cooperation seen by the administration as necessary to meet the nation's problems, and that he looked forward to working with it.

In the course of its organizational work the council voted the reelection of Walter S. Hallanan of Plymouth Oil Co. as chairman for 1953; R. G. Follis of Standard Oil Co. of California as vice chairman; A. Jacobson of Amerada Petroleum Corp. as chairman of the agenda committee; and Frank M. Porter, president of the American Petroleum Institute, as chairman of the appointment committee.

Tidelands Forecast

NPC told output in 5 years can be 200,000 bbl. daily

WASHINGTON. — Production of 200,000 bbl. daily of petroleum liquids and 600,000 to 800,000 M.c.f. of natural gas from the Continental Shelf within a period of 5 years if present obstacles to development are eliminated is predicted by a National Petroleum Council committee headed by L. S. Wescoat of the Pure Oil Co.

The committee's forecast was made in an interim report to the council February 27. But it pointed out that the 5-year period to which its study was limited in the Interior Department's request for information is inadequate for an evaluation of the contribution of future oil and gas supplies of a major new province such as the offshore area.

Exploration and drilling in the initial 5-year period of unimpeded development will be more important in locating major oil and gas fields for the future than in providing immediate availability, it was pointed out.

Furthermore, the committee said, its outlook is based on the assumption that existing leases will be confirmed and additional leases will be granted on a basis which will encourage exploration and development of the Continental Shelf.

While the committee has not completed its studies on the technological aspects of development on the Continental Shelf, the report said, it is of the opinion that an important number of major oil and gas fields will be discovered within 5 years. Further, it added, drilling after the 5-year period should increase availability rapidly because of additional development on discovered fields, improved techniques, and later discovery and development resulting from continued exploration.

Rubber Sale Urged

Offer synthetics plants to industry, RFC advises Ike

WASHINGTON.—Sale of the Government's synthetic-rubber facilities was recommended to President Eisenhower last week by the Reconstruction Finance Corp.

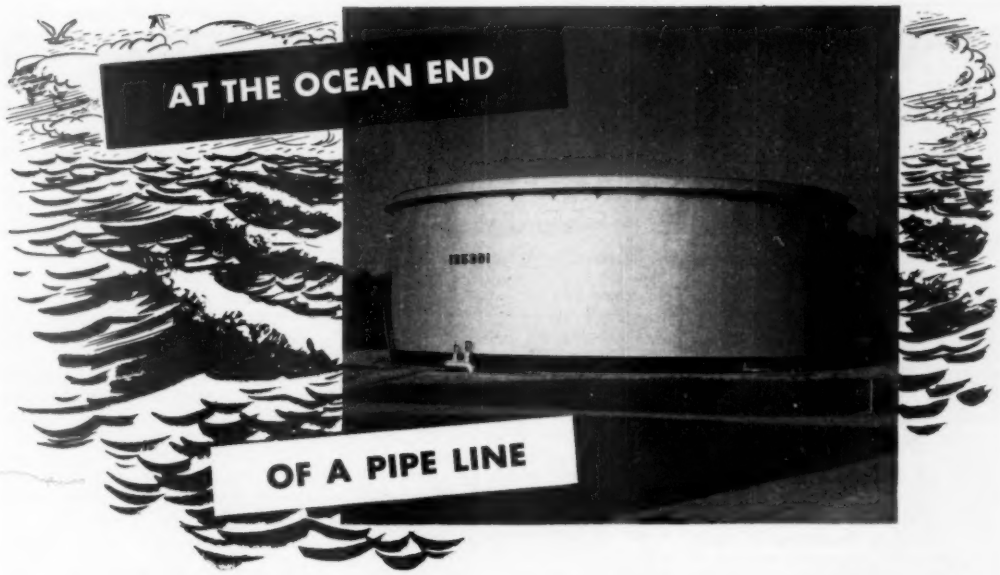
The RFC did not set a price at which the 29 facilities should be sold but said their net carrying value does not represent the unrecovered cost of the synthetic-rubber plants, which it placed at $446,400,000. The return to the Government, it said, should be the maximum "consonant with the attainment of a competitive industry."

If the administration agrees that the plants should be sold, RFC Administrator Harry A. McDonald said, the facilities have just been appraised by an independent engineering firm and the Government is in a position to proceed with disposal as soon as permissive legislation is enacted.

McDonald told the President that the production of synthetic rubber has developed to the point where, in private hands, it would be able to survive in competition with natural rubber. But in selling the plants, he said, the Government should receive assurance that the facilities will be maintained as a

Charge to Cracker Boosted

Modifications to this No. 2 cat cracker, framed by expansion loops in foreground, at Humble Oil & Refining Co.'s Baytown, Tex., refinery, have raised its feed rate from 42,000 to 60,500 bbl. daily. Humble also increased charge capacity to its No. 1 unit from 36,600 bbl. daily to 60,500 bbl. daily, thus giving the units a combined charge capacity of 121,000 bbl. daily.



Union Oil Company built a new pipe line to bring crude from the Newhall, Santa Paula and Ojai Valley oil fields to the Coast. At the ocean end of the line is a 135,000-bbl. tank equipped with a Horton Pontoon Floating Roof to store the crude prior to shipment by tanker.

The 142-ft. diam. by 48-ft. 3-in. tank is located at Ventura, California. Crude stored in the tank is loaded into tankers through submarine lines for shipment to Union Oil Company refineries at Los Angeles. The tank's 135,000-bbl. capacity is approximately one tanker load.

A carpenter's rule is being held against the top of the sealing ring to demonstrate its close fit to the tank shell.

Storage of crude oil and other volatile hydrocarbons in tanks equipped with Horton Floating Roofs is sound economically. The bottom of a Horton Floating Roof is normally in direct contact with the liquid in the tank. This eliminates any air-vapor mixture above the liquid and prevents the loss of vapor due to breathing or filling and emptying. Fire hazard and corrosion are also reduced as a result of the elimination of the vapor space in the tank.

Closing the space between the deck of a Horton Floating Roof and the shell of the tank is the Horton Seal. Vertical flexures every 22 inches allow the sealing ring to expand and contract to conform to the inside of the tank shell. Hangers supporting the seal hold it in close contact with the shell at all times. A gas tight, weather-proof flexible fabric closes the space between the top of the sealing ring and the deck of the floating roof to complete the seal.

Horton Floating Roofs are built in three types—Double-Deck, Pontoon, and Pan—with the Horton Seal as standard equipment on all three. Complete information estimates or quotations on Horton Floating Roofs may be obtained by writing our nearest office.

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Havana.....402 Abreu Bldg.
Houston, 2.....2119 C & I Life Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
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Philadelphia, 3.....1615-1700 Walnut Street Bldg.
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WATCHING WASHINGTON

Bertram F. Linz

Killing Off the RFC

The Federal Government will get out of business in a big way if plans to liquidate the Reconstruction Finance Corp. get through Congress this year.

Elimination of the RFC would mean that the rubber, fiber, and other enterprises it conducts would either be disposed of to private industry or transferred to other agencies. The President is required to submit a report soon recommending disposal of the synthetic-rubber plants and is expected to say they should be transferred to private hands.

A bill to liquidate the RFC has been introduced by Sen. Harry F. Byrd of Virginia, a Democrat, but it has been given the support of many Republicans. All recent surveys of government operation, including the Hoover commission, have agreed that the agency should be discontinued.

The RFC was established in 1932 as a lending agency as part of the program to halt the depression. Currently it employs more than 2,000 people and has outstanding loans of some $700,000,000.

Tidelands Bill Snags

Enactment of tidelands legislation may not prove to be the easy job it was thought to be a month ago.

A number of roadblocks appear to be in the making which may make Senate passage of quitclaim legislation difficult and will certainly drag it out.

Sen. Estes Kefauver of Tennessee will make a strong drive to secure adoption of his alternative measure providing for an exhaustive study of the whole question of the marginal belt and the continental shelf.

Sen. George W. Malone of Nevada has intimated he will support an amendment providing that if the tidelands areas are returned to the states the mineral resources of the public land states also shall be ceded.

A number of senators have intimated they will make an effort to talk the measure to death, and a filibuster could delay passage indefinitely and kill off the hope of the Republican leadership to dispose of the legislation this month.

There is nothing in the situation at the moment to indicate that there is any real danger that the bill will fail of passage, but opponents of state title have by no means given up their fight.

Gas-Storage Foe

The coal industry appears to be planning a drive to prevent natural-gas companies from developing underground storage.

The attack on underground storage of gas will be based on the charge that such reservoirs in the vicinity of coal mines are creating fire and explosion hazards by the seepage of gas into the mines. Gas industry spokesmen say there is no more danger from storage reservoirs than there is from producing gas wells.

At the present time there are about 140 underground gas storage projects in 18 states, a number of them in Pennsylvania's coal-mining area.

Just what the coal industry plans to do about it has not been disclosed, but they may come to Congress for a law authorizing the Federal Power Commission to deny applications for development of underground storage in areas where it might present a hazard to other interests.

Depletion Study—Again

A full-scale study of the percentage depletion allowance, the option given the oil and gas industry by present law to expense certain expenditures, the federal taxes on oil, and other provisions of interest to the industry is scheduled to start within the next few months.

The House Ways and Means Committee will make this study as part of its program for review of all of the revenue laws for the purpose of codifying them, the first codification since 1939.

The plan of the committee to go into depletion and other oil-tax provisions does not necessarily foreshadow a new attack on the allowance such as was repeatedly made during the Democratic administrations of the Treasury Department. It is not anticipated that any recommendations will be made by the Treasury for repeal of depletion for oil and gas, but some suggestions may be advanced with respect to the allowance for other resources.

going, progressive, and readily expansible industry because the ready availability of synthetic rubber is vital to our national security.

Disposal plan . . . The disposal plan recommended by the RFC calls for the development of an industry pattern that will permit the free operation of competitive forces by avoiding situations of dominance and assuring a supply of rubber to those users who do not purchase facilities.

Under the RFC plan of disposal, the Government would invite "indications of interest" for the purchase of the facilities and then would negotiate with the bidders.

Consultations would be held with the Attorney General and Federal Trade Commission to determine the sales that would achieve maximum conformance to the criteria set for the negotiations, but no sales would become final until Congress has an opportunity to examine the program as a whole.

PAD Begins Dissolution

WASHINGTON.—Anticipating that it will go out of existence June 30, the Petroleum Administration for Defense has started to dismantle the organization gradually.

First section of the agency to be affected is the gas division, whose branches are being closed down as need for them ceases.

By the end of this month the PAD staff is expected to be down to 189 as compared with 338 a year ago.

Deputy Administrator J. Ed Warren has no immediate plans for curtailing the offices dealing with oil, pointing out that outside conditions, such as the legislation which may be passed by Congress affecting the defense program, will be taken into consideration.

ROCKY MOUNTAIN

North Dakota Joins Compact

BISMARCK, N. D.—Both houses of the North Dakota Legislature have passed a resolution giving Gov. C. Norman Burnsdale authority to sign an agreement providing for North Dakota's entry into the Interstate Oil Compact Commission.

The North Dakota action followed on the heels of the Wyoming Legislature's approval of a similar resolution. *(The Oil and Gas Journal, March 2, page 35).*

North Dakota is the twenty-second member of the commission. Two states without oil or gas production hold associate memberships.

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MAIN PROCESS EQUIPMENT at the new Kent refinery includes an 80,000-bbl. distillation unit, right background, and the cat cracker under construction at left.

COOLING WATER is supplied from the Medway River through this 4,000-ft. long concrete channel.

EUROPE

Kent Refinery Operating

New plant processing about 40,000 bbl. daily; completion of entire program later this year to double this figure

Dahl M. Duff

ANGLO-IRANIAN OIL CO., LTD., announced last week that its new Kent refinery in England had gone into initial operation and that the first products will leave the plant in the next few days.

The refinery is located on the south side of the Thames River about 40 miles below London. Work was begun in mid-1950 on what was then planned to be a 40,000-bbl. refinery. Subsequently, the project was expanded to provide for a capacity of 80,000 bbl. daily.

The refinery is now in operation at approximately 40,000 bbl. daily, but throughput will be stepped up to the full 80,000 bbl. daily later this year. Opening of the refinery was delayed slightly by the floods in early February which caused widespread damage in parts of England, the Netherlands, and Belgium. The plant was flooded to a depth of several feet, and for a time all roads into the area were closed.

Europe's biggest . . . The crude-distillation unit at the refinery has a nominal capacity of 80,000 bbl. daily and is the largest in Europe. This unit, originally intended for the Haifa refinery in Israel, was designed and constructed by the Badger Process Division of Stone & Webster Engineering Corp. E. B. Badger & Sons (Great Britain), Ltd., was the contracting firm which served as managing agents for Anglo-Iranian on the project. The distillation unit consists of a pre-flash column and a main column with the usual accessories.

Units placed in operation initially comprise the distillation and auxiliary blending plants. The second and third stages of construction providing for the fluid catalytic cracking unit and lubricating-oil plants, are scheduled for completion this year. A special products plant may be installed later. *(For detailed description of the Kent refinery, see The Oil and Gas Journal, December 20, 1951, page 310).*

Yields . . . Completion of these two later stages will allow the refinery to operate at its full rated capacity with yields approximately as follows: fuel oils, 37,000 bbl. daily; gasoline, 20,000 bbl. daily; gas oil, 10,000 bbl. daily; kerosine, 2,200 bbl. daily; lubricants, 2,700 bbl. daily; and tractor oil, 600 bbl. daily.

Crude for the new Kent refinery will come largely from Kuwait, where production is controlled by Anglo-Iranian and Gulf Oil Corp. The facilities at the plant include four jetties where the largest ocean-going tankers can unload at all stages of the tide.

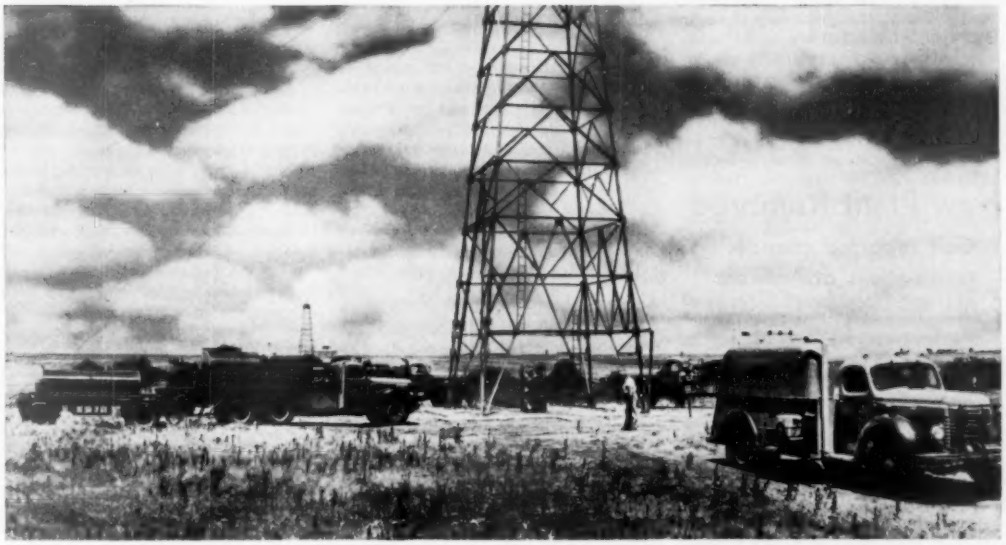
The refinery covers about 600 of the 2,000 acres which the company owns on the marshy Isle of Grain. Total cost will amount to the equivalent of about $112,000,000. At full capacity, it will employ a staff and work force of 1,500.

Unusual water system . . . One unusual feature of the refinery facilities is the design of the cooling-water system. At full capacity, the refinery will require about 4,000,000 Imperial gallons per hour. A new section of sea wall was constructed to enclose a small bight on the foreshore of the Medway River and form a reservoir of about 16,000,000 gal. capacity. The refinery reservoir will be filled by tidal action through balanced flap valves and will contain sufficient water for plant operation in the period between tides at the initial planned throughput. Later it will be necessary to augment the natural flow by pumping. However, the tidal intake will save installation and permanent pumping costs of about 350 hp.

Completion of the Kent refinery is a major step in Anglo-Iranian's program of replacing the half million barrels daily of processing capacity lost with the nationalization in Iran. By the end of the first quarter of 1953, Anglo-Iranian will have increased its refinery production outside Iran by 160,000 bbl. daily since the Abadan shutdown. This total consists of the initial output at Kent, the 29,500 bbl. daily from the newly opened Anglo-Iranian-Petrofina refinery in Belgium,

SELECTIVE ACIDIZING SOLVED DIFFICULT RECOMPLETION

Production increased from 10 to 120 BOPD following acidizing workover



A problem existed in this newly deepened well: How to acidize the bottom zone while the depleted upper sections remained exposed in the open hole. It was recognized that an acid treatment by conventional methods probably would not be successful.

For this reason, it was decided to use the Dowell Electric Pilot on the job. The Selective Acidizing electrode was seated at the bottom end of the tubing string just above the new pay zone. Two pumps were used at the surface, one on the tubing and the other on the casing. Acid was pumped down the tubing, oil was pumped down the casing. The acid-oil interface was adjusted to the electrode level and maintained throughout the treatment by altering the pumping rates at the surface. This provided positive indication that the acid entered the lower zone.

As a result, production was increased from 10 BOPD to 120 BOPD.

If you would like to know more about Dowell's Selective Acidizing, the Electric Pilot, and the many other Dowell oil field services available to you, be sure to call the nearest Dowell office. Or, if you prefer, write directly to Tulsa, Dept. C11.

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and the increased production at 10 other company refineries.

Further expansion . . . Further large increases in Anglo-Iranian capacity will come into operation during the next 2 or 3 years. The company is building a 60,000 bbl. daily refinery in Western Australia, and work recently began on the 100,000 bbl. daily refinery at Aden.

The Kent refinery is the company's third major plant in the United Kingdom. As a result, Anglo-Iranian capacity in the United Kingdom this year will rise to about 200,000 bbl. daily, making the company the largest single refiner of a total capacity in the country of about 520,000 bbl. daily. Anglo-Iranian's other major refineries in the United Kingdom are at Llandarcy in South Wales and Grangemouth in Scotland.

New Plant Rumored

Gulf reported considering construction at Antwerp

GULF OIL CORP. is considering the construction of a new refinery in Antwerp, Belgium, according to reports from Europe last week.

The proposed plant would be built within the city limits of Antwerp and would have a capacity of 1,000,000 tons annually, or about 20,000 bbl. daily.

Thus far, the project is understood to be in the preliminary planning stage. If it materializes, it would be Gulf's only refining operation in the Eastern Hemisphere, where it is already an important producer through its half interest in Kuwait Oil Co., Ltd. The company now has a small minority interest in the Esso Francaises Port Jerome refinery in France. In recent weeks, persistent trade reports are that Gulf is actively seeking outlets for its share of the Kuwait production which has been running between 700,000 and 800,000 bbl. daily. Gulf is said to be negotiating for the sale of Kuwait oil in Latin America and in the United States.

Competing partners . . . The Antwerp refinery project also is of interest in that it apparently would place Gulf in direct refining competition with Anglo-Iranian Oil Co., Ltd., its producing partner in Kuwait. Anglo-Iranian completed a new refinery with a capacity of around 40,000 bbl. daily at Antwerp about a year ago. During the last year and a half, Kuwait production has been increased sharply as Anglo-Iranian turned to this source to replace much of the crude lost in the Iranian nationalization.

Dollar Allocations Cut

French replace 75-25 dollar-franc payment ratio with new 60-40 scale to pay American suppliers of Middle East oil

REDUCED dollar allocations now are in effect for American suppliers of oil into France.

The French Government is paying off American suppliers during the first quarter of this year 40 per cent in French francs and 60 per cent in dollars. The ratio formerly in effect was 25 per cent francs and 75 per cent dollars.

The oil affected by the ruling is Middle East crude, principally Saudi Arabian, which is imported into France by American companies for the French refining and marketing companies with which they are affiliated. The main companies involved are Standard Oil Co. (N. J.), California Texas Oil Co., Ltd., and Socony-Vacuum Oil Co., Inc. Smaller amounts are imported by Gulf Oil Corp. and Atlantic Refining Co.

Arrangement not accepted . . . Reports are that the new basis of dollar payment has not been accepted by any of the principal companies concerned. The allocations are made quarterly, and when a supplier exhausts the dollars made available, the alternative is one of taking francs above the former percentage or discontinuing those imports. The basis on which the second quarterly imports will be made is expected to be made known the middle or latter part of this month.

The 75-25 dollar-franc ratio was established after discussions with representatives of the American companies about 2 years ago. At the time, the American suppliers agreed to accept and use this amount of French currency, provided prices on the French market were reasonably competitive. The French asked that the materials and supplies bought with the francs be used within the general company organization without displacing normal French exports.

The latest action of French Government's financial authorities apparently was caused by the continued dollar shortage in the French company. It has drawn attention to the general currency position of American oil companies in Europe and the extent to which the operations of these companies will be affected in the future.

The American operators recognize the necessity of using the maximum amount of foreign currencies in view of the fact that the bulk of their production from the Middle East is sold in Europe. During the steel shortage following last year's strike, one large company was helping solve two problems by importing European pipe into the United States for its domestic operations. However, the entire question of obtaining equipment in Europe runs into high prices ranging up to more than twice those in the United States for many items, and delivery times often months longer than those from United States manufacturers.

The prospect appears remote for any marked easing in the dollar supply of most European countries. Company experts doubt that there is any chance for full convertibility of sterling in the near future. A sharp slash in the dollar-aid expenditures of the new Republican administration in Washington would make the situation worse and add to the pressure on the companies to take even a greater part of their oil payment in soft currencies.

Competition . . . Another ever-present and important factor is the availability of competitive oil produced by non-dollar, mainly sterling or British, suppliers. Since Britain trades heavily with the continent, most European countries are fixed much more firmly with sterling. The deficit in refining capacity and crude production arising from the loss of the Iranian properties has prevented any problem of this nature from arising. However, crude supply is now in relative oversupply, and some European countries have built up surplus refining capacity. The availability of a much greater quantity of oil from Iraq from the French share in that operation may have figured in the French decision to cut the dollar oil allocations.

The present position of the countries of Europe in respect to dollar oil payments differs widely. Imports into the United Kingdom are under the long-term sterling agreements made by the American companies 2 years or more ago. Italy pays 100 per cent in dollars for American oil but asks that all dollar funds possible be returned to the country by equipment purchases and reinvestments. In most of the other countries, sales, sometimes on a split currency basis, are arranged according to conditions existing at the time. These arrangements apply to American-produced oil in the Middle East. Venezuelan and other Western Hemisphere oil continues to be paid for entirely in dollars.

Concessions Unraveled

Peruvian Government completes auction of 110 parcels of acreage on which overlapping concession claims were filed

THE awarding of acreage under the 1952 Peruvian petroleum law was completed recently when ministry officials auctioned off 110 parcels which had been covered by duplicating applications.

The auctions were held publicly under government direction in Lima and extended over a period of 5 days. Many overlapping claims were filed last October 28 when the filing period for foreign operators opened, and as provided in the law, the auction procedure was used to make the awards of these areas.

The total acreage position of each company now consists of the total obtained in applications not overlapped last October, what was granted subsequently as a result of the priority given exploitation applications over exploration applications, and finally the amount secured on high bid in the auction of the overlaps.

Sechura concessions . . . The area of greatest interest is in the Sechura Desert along Peru's northern coast. This area of roughly 2,000,000 hectares, or nearly 5,000,000 acres, is completely covered by concessions. In view of the competition for this acreage, the individual company holdings are cut up considerably. The general locations of the Sechura Desert concessions of most of the major operators are:

Richmond Exploration Co. (Standard Oil Co. of California), acreage in a broad north-south belt in the eastern part of the Sechura; International Petroleum Co., Ltd., largely in the southwest but also in northwest and west central; Conorada Petroleum Corp. (Amerada Petroleum Corp., Ohio Oil Co., and Continental Oil Co.), in the northwest; Seaoil, Ltd. (Canadian capital), in southwest and also scattered areas in the west central; Wiese (Peruvian) interests, in north central section; Petrolea Peruana (Peruvian), in south central section; and Gulf Oil Corp., scattered holdings over the entire area.

Further exploration . . . With the acreage awards now completed, the concession-holding companies are now scheduled to work out operating details and get under way with their exploratory programs. It is likely that several rigs will be running in Sechura exploratory work by early next year. Several of the companies have already done geophysics in earlier reconnaissance investigations over parts of the area. International has done reconnaissance gravity meter and seismograph work as well as reflection and refraction detailing; Conorada carried out detailed gravity and magnetometer work; Gulf did a 2-months aerial magnetometer survey; and Richmond last July did seismograph and gravity work.

In the recent auctions, of a total of 110 parcels, 106 were in the Sechura, and four in the eastern Oriente zone. The overlapped areas which were auctioned off involved a total of 486,030 hectares, or about 1,200,000 acres. The government obtained a total of 38,346,531 soles, or about $2,460,000. The coastal (Sechura) acreage went for an average of 81.60 soles/hectare, or around 21 cents an acre. The acreage awarded in the Oriente zone as a result of the auctions went for 0.59 sole/hectare, or about 1½ cents an acre.

Concessions disclosed . . . Two of the five United States companies taking concessions in Peru have recently announced their acreage position. Standard Oil Co. of California said its new concessions in Peru cover 650,000 acres. International disclosed its total amounted to 712,000 acres—472,000 acres uncontested and 240,000 acres bid in at the auction. The Peruvian law limits single companies to 400,000 hectares, or about 990,000 acres, of which 300,000 hectares can be in exploration and 100,000 hectares in exploitation.

Peruvian Products Price Up

Some of the price increases in petroleum products sought for years by the companies operating in Peru have been authorized by the government.

The action was taken in a decree reported to have been promulgated by Gen. Manuel Odria, the republic's president. In London, Lobitos Oilfields, Ltd., said the increases would reduce the heavy losses incurred on these sales but still would be insufficient to cover total cost of the products.

The companies operating in Peru, principally Cia. Petrolera Lobitos and International Petroleum Co., Ltd., have been required to meet the needs of the

New Officers of Los Angeles Nomads

Directing activities of the Los Angeles Chapter of Nomads this year will be these new officers: (left to right) Bill Wilson, Web Wilson Tools, Inc., junior regent; Jerry Engstrand, Grant Oil Tool Co., senior regent; Joe Schlarb, Chiksan Co., sergeant-at-arms; Jim Hughes, Lane-Wells Co., president; John Flanagan, Johnston Testers, Inc., vice president; Bill Sargent, Sargent Engineering Corp., secretary; Bob Craig, National Supply Co., treasurer; Wally Sawdon, Technical Information Service, executive secretary. Not shown are Vern Mitchell, Security Engineering Division, assistant secretary; Leo Cypher, Baash Ross Tool Co., assistant treasurer; and Ox Morgan, Oil Well Manufacturing Co., deputy sergeant-at-arms.

domestic market at controlled prices below world levels. Last year a government commission was set up to study the question and later issued a report recognizing that the companies should be permitted a reasonable profit on the products sold domestically.

MIDDLE EAST

Riot in Iran

Mossadegh victory deemed blow to oil settlement

THE negotiations to settle the Iranian oil dispute were thrust in the background last week while Prime Minister Mossadegh beat back a serious challenge to his political power.

For a while, it appeared as if the government which nationalized the British-owned oil industry almost 2 years ago might be ousted. The 77-year-old prime minister fled out the back door of his house in Teheran while a mob clamored at the front. He took refuge in the parliament and gradually restored his control over parliament and the country while his own supporters went into the streets and demonstrated in his behalf.

Uprising a surprise . . . The uprising against the prime minister demonstrated that his grip on the country is less secure than many observers had thought. The moves against him were instigated by army officers and some members of the court of the 33-year-old monarch, the Shah, and were later joined by followers of the fanatically nationalistic religious leader, Ayatollah Kashani.

There was little hope for a successful outcome of the oil negotiations before this latest rioting, and even less afterwards. Even if Dr. Mossadegh were inclined to accept the United States - British offer, it is considered questionable if his government could withstand the turmoil a settlement would create. The lack of oil revenue and the foreign - exchange shortage caused by the nationalization mainly has affected Iran's merchants and the commercial community who do not have the power to force an oil settlement.

In the emotional atmosphere of Teheran, there are now none who can speak out openly against the government's course—the nationalization of the industry and the breaking of the concession contract, the expulsion of the British staff, and the repeated refusal to accept what seem to be highly generous terms for a settlement. The benefits of the oil industry never reach the people of Iran to the extent that the loss means much of a hardship in their already backward and distressed condition.

Meanwhile, in Venice, an Italian court postponed until March 12 a decision in the suit brought by Anglo-Iranian Oil Co., Ltd., against the charterers of the tanker Miriella who exported a cargo of fuel oil from Abadan. It was reported that the tanker had left Italy for another load of Iranian oil.

Haifa Plant Pact Extended

An agreement extending the arrangement under which Consolidated Refineries, Ltd., has operated its Haifa refinery has been initiated in Tel Aviv by representatives of the company and the Israeli Government.

The new agreement is reported to make certain changes relating to the payment of income and other taxes by the refining company and to assistance in petrochemical operations.

Consolidated Refineries, owned by Anglo-Iranian Oil Co., Ltd., and Shell, has been operating the Haifa plant at reduced throughput since 1948 when the normal flow of crude oil from Iraq was cut off by the Arab-Israeli war.

World Briefs

Oil-bearing formations have been found in the Nahorkitya test of Assam Oil Co., Ltd., 18 miles west of Digboi in Northeast India. The well is being carried below 9,700 ft., the depth at which the indications of production were encountered, in order to investigate lower horizons. The well ranks as the deepest in India.

Gun-perforating equipment has been flown from the United States for use in testing Associated Australian Oilfields' well in the Roma district in southern Queensland. The well was the object of considerable interest in Australia recently when it found what were said to be "promising oil sands" *(The Oil and Gas Journal, February 16, page 108).*

Representatives from the production departments of affiliates of Standard Oil Co. of New Jersey met late in February in Maracaibo, Venezuela, for technical discussions on producing developments and techniques. The meeting, the first of the annual technical conferences held in the western Venezuela city, was attended by about 2,000 persons.

Exploration work in the Lovaszi district of Hungary near Nagy-Kanisza has been accelerated over the past year, according to reports from Vienna. This activity has been partly inspired by reports that production has been found in Yugoslav and Austrian territory bordering on the Nagy Kanisza area.

A long-range plan for the Egyptian petroleum industry is reported to be in preparation under the direction of the Egyptian minister of commerce and industry. One of the most important points in the new program emphasizes the necessity of resuming exploratory work which has been suspended for nearly 3 years. The unfavorable 1948 Egyptian Mining Law caused companies operating in Egypt to discontinue exploration and confine their activities to production from existing leases. The fields are expected soon to show a gradual decline in output which will force Egypt to rely even more heavily on petroleum imports.

A new planning board which will study and make recommendations on Colombia's requirements for refineries, pipe lines, and distribution and transportation facilities has been created by a recent resolution of the Colombian minister of mines and petroleum, Rodrigo Noguera Laborde. The board will consist of the minister, the manager of the government's Empresa Colombiana de Petroleos, or their delegates, a representative of private oil companies operating in the country, and a representative of the Colombian National Association of Industries.

The present world total of tanker tonnage of 19,989,000 tons gross represents 22 per cent of all steamship and motor ship tonnage, according to the 1953 edition of the appendix to Lloyd's Register Book. A year earlier, this figure was 21 per cent. In 1939, the world tanker fleet at 11,586,000 tons gross accounted for 17 per cent of the total. During the year ended July 1952, the period reviewed, tanker tonnage increased by 1,460,000 tons gross.

To obtain information on engine cooling and lubrication problems when passing through varied climatic conditions, Vacuum Oil Co., Ltd., and Austin Motor Co. are sponsoring an 8,000-mile, nonstop motor expedition from Entebbe in Uganda, Africa, to Jokkmokk, Sweden. An Austin sedan is being driven by three British drivers over the route in less than 2 weeks with ferry crossings where necessary. The vehicle, which is equipped with special instruments, will leave Uganda March 17.

Richfield Veep

William Travers now in 25th year with company

WILLIAM J. TRAVERS, the newly elected vice president of Richfield Oil Corp., has been with the company since his graduation from Stanford University in 1928.

Travers, who had been assistant manager of exploitation since 1945, also has been named exploitation department manager in charge of drilling and producing operations.

A native of the Brea Olinda oil field area, northeast of Fullerton, Calif., he was graduated from Fullerton High School and majored in engineering at Stanford.

He joined the company as a petroleum engineer in the Los Angeles general office. In 1937 he took charge of Wilmington development as division petroleum engineer and from 1939 to 1945 he was superintendent of the San Joaquin division.

He is a charter member of the Los Angeles Petroleum Club and has been active in the American Petroleum Institute.

W. L. McKinnon has been named manager of the research laboratory in the recently organized exploration and production - research division of Shell Development Co., Houston. Other appointments in the division include: **W. R. Purcell,** manager of the chemical department; **C. H. Fay,** manager of physical department; and **R. J. LeBlanc,** manager of the geological department.

J. T. Moore has been appointed superintendent of construction for Great Lakes Pipe Line Co., replacing **W. R. Luckfield, Jr.,** who has been transferred.

Elmer E. Powell has been named assistant supervising engineer in the materials inspection and expediting division of Standard Oil Development Co.'s Esso engineering department. He recently returned from an assignment supervising materials inspection and expediting for new refinery construction in Europe and will take charge of the division's Pittsburgh office.

W. P. Orr, senior petroleum engineer for Humble Oil & Refining Co. in its Hawkins district, has been promoted to district petroleum engineer in the Palestine district, East Texas division. Other changes include: **C. S. Yust,** tool pusher in the California area, transferred to the Lovell Lake district, Gulf Coast division; and **McIver Hay,** North Cowley district, and **Leroy Harper,** Potash district, Louisiana division, promoted from temporary to permanent tool pushers.

William C. Blackburn, district petroleum engineer for Continental Oil Co. at Casper, has been transferred to Lance Creek, Wyo., as area foreman.

Leon Jacolev has resigned from The Texas Co., New York, to engage in a consulting practice at Montclair, N. J. He is specializing in various phases of synthesis gas generation and utilization, with emphasis on process and economic evaluations. During his 8 years with Texaco he was a chemical engineer in the technical and research division.

T. R. Brennan, plant superintendent for Natural Gas Pipeline Co. at Stinnett, Tex., has been promoted to field superintendent of compressor stations at Beatrice, Neb.

H. L. (Pete) Long, Kilgore, Tex., independent operator, has been elected chairman of the East Texas section of the American Institute of Mining and Metallurgical Engineers. Other officers are: **Joe Morris,** Magnolia Petroleum Co., Kilgore, vice chairman; and **Herb Miller,** Amerada Petroleum Corp., Longview, Tex., secretary - treasurer. Named to 2-year terms on the board of directors were: **L. H. Dial,** East Texas Salt Water Disposal Co., Kilgore; **Fred Nabors,** Stanolind Oil & Gas Co., Longview; and **Audrey Cook,** Tide Water Associated Oil Co., Kilgore.

HARRY MILLER

Harry Miller, production superintendent for Continental Oil Co.'s West Texas - New Mexico division at Midland, Tex., has been named assistant production manager for the central region at Oklahoma City. He succeeds **E. C. Wilbur,** Oklahoma City, who has retired after 34 years with Continental. **A. A. Anders,** formerly East Texas district production superintendent at Tyler, has been named to succeed Miller at Midland.

John G. Keener, chief station engineer for Mid-Valley Pipeline Co., has been transferred from Magnolia, Ark., to Hornsby, Tenn.

Tom Jack, drilling superintendent for Preston Carter Drilling Co., Ardmore, Okla., has been transferred to Ardmore.

A. L. McGehee, engineer for Sinclair Oil & Gas Co. at St. Louis, has been transferred to Seminole, Okla., as an oiler.

Donald I. Lawless, manager of exploration for Canadian Bishop Oil, Ltd., has been elected a member of the board of directors of the company. Lawless currently is stationed in Calgary.

Henry W. Havins has been promoted to division foreman for General Petroleum Corp.'s gas department at Ventura, Calif. He has been plant foreman at Ventura since 1932.

W. E. Hopkins, Jr., a technologist for Shell Oil Co. at New York, has been promoted to assistant manager of the lube-oil department at Shell's Wood River, Ill., refinery.

R. Alvin Summers, formerly superintendent of the Oklahoma exploitation district for Sunray Oil Corp., at Oklahoma City, has been named supervisor of the company's safety and training section of its new industrial-relations

PERSONALS

Participate in A.A.O.D.C. Panel

These men recently took part in a panel discussion on the design, production, and application of jet bits before 75 members and guests of the Fort Worth-Dallas chapter of the American Association of Oilwell Drilling Contractors. Left to right, they are: George Cannon, chief engineer in charge of jet-drilling design and application, Humble Oil & Refining Co., Houston; W. E. Scarborough, chief drilling-tool engineer, Reed Roller Bit Co., Houston; Harold Nolley, chief engineer in charge of design and production of rock bits, Hughes Tool Co., Houston; Gilbert Rowe, general operations manager, Rowan Drilling Co., Fort Worth, panel moderator; J. D. Poe, West Texas drilling superintendent, Loffland Brothers Co., Odessa, Tex.; A. B. McLemore, drilling superintendent, Holmes Drilling Co., Houston; and John Rhea, drilling engineer, Southeastern Drilling Co., Dallas.

department at Tulsa. **Forney Hutchinson, Jr.,** who joined Sunray in 1937 as an attorney, has been named head of the department. **V. L. Smith,** formerly assistant Oklahoma district superintendent at Oklahoma City, has been named superintendent of the Oklahoma district.

Drew L. Hines, vice chairman of the operating committee, eastern division, Tide Water Associated Oil Co., will become chairman of the committee May 1 succeeding **B. I. Graves** who plans to retire on that date.

Floyd Brett has been appointed general superintendent of production for Sinclair Oil & Gas Co. His headquarters will remain in Tulsa where he has been assistant general superintendent of production the past 2½ years. Brett joined Sinclair in 1933. During the last half of 1951 he was given a leave of absence to become assistant director of production for the Petroleum Administration for Defense in Washington, D. C.

Leslie M. Cochran has resigned as manager of Uinta Oil Refining Co. at Jensen, Utah, to accept a field position with E. I. du Pont de Nemours & Co. in its petroleum-chemicals division. He will be replaced by **Fred O. Case,** formerly maintenance superintendent for Cooperative Refinery Association in Coffeyville, Kans.

Harold Bottomley has resigned as vice president in charge of sales and process design for Refinery Engineering Co. He will open offices in Tulsa as a petroleum-processing consultant. During World War II Bottomley served as a senior administrative assistant for the Petroleum Administration for War. Later he became chief plant engineer for Republic Oil Refining Co., Texas City, Tex.

Tal Ledbetter, division drilling and production superintendent for Union Oil Co., has been elected chairman of the Los Angeles Basin chapter of the Pacific Coast district of the American Petroleum Institute. Other officers include: **Marshall C. Turner,** Continental Consolidated Corp., vice chairman; **Herman Schaller,** McCullough Tool Co., secretary-treasurer; and **Dean R. Hoffman,** Lane Wells Co., assistant secretary-treasurer.

W. E. Gillen, district engineer for Texas Pacific Coal & Oil Co., has been transferred from McCamey to Odessa, Tex.

Dr. J. Robert Berg, associate professor of geology at the University of Wichita, has been named head of the geology department succeeding **Dr. Walter Ver Wiebe,** who is retiring as department head. Dr. Ver Wiebe will continue his teaching duties and devote more time to writing for petroleum publications.

Thomas A. Steele, formerly an area engineer for Ohio Oil Co. at Hobbs, N. M., has been named district petroleum engineer at Midland, Tex. He has been with Ohio 11 years, having worked in Kansas, Michigan, and New Mexico.

J. D. Goodrich, chief mechanical engineer for Shell Oil Co. at Tulsa, has been appointed North Texas produc-

J. D. GOODRICH

J. W. ROCHE

tion division manager at Wichita Falls. He replaces **J. W. Roche,** who has been transferred to the Denver office as Colorado division production manager. Goodrich will be replaced in Tulsa by **T. H. Dwyer,** who has been in New York since July 1951.

J. V. Dunbar, Dunbar Drilling Co., has been named chairman of the newly organized chapter of the American Association of Oilwell Drilling Contractors in Denver. Other officers include: **R. L. Manning,** head of R. L. Manning Co., vice chairman, and **Will I. Lewis, Jr.,** Will I. Lewis Drilling Co., secretary.

M. E. Spaght and **A. J. Galloway** have been elected to the board of directors of Shell Oil Co. Spaght, formerly president of Shell Development Co., the research affiliate of Shell Oil, recently was appointed executive vice president of Shell Oil. Galloway is vice president in charge of the company's exploration and production activities in the United States and Canada.

PERSONALS

Wilbur E. Kelley, formerly manager of the New York operations office of the U. S. Atomic Energy Commission, has been appointed vice president in charge of engineering for Catalytic Construction Co., Philadelphia. In his new capacity he will direct all engineering phases of the company's activities in the oil refining, chemical, and petrochemical fields.

Claude V. Barrow, veteran oil editor of the Daily Oklahoman and Times, Oklahoma City, recently was honored for his more than 25 years of writing oil news. He was presented a gold watch by William T. Payne, president of the Mid-Continent Oil and Gas Association at a Chamber of Commerce forum luncheon. Barrow, who came to Oklahoma City 29 years ago, also has worked in San Antonio, Fort Worth, Tulsa and Hugo and Ardmore, Okla.

Frederick Bockelman, district geologist for Tide Water Associated Oil Co. at Houston, has been transferred to Corpus Christi. **Frank G. Melkie,** associate engineer at Spraberry, Tex., has been promoted to field engineer at Venice, La.

Roy M. Fly, purchasing agent for Western Gulf Oil Co., Los Angeles, has been appointed foreign coordination officer of the Petroleum Administration for Defense. Fly succeeds **Monty Garrison, Jr.,** who is completing his 1-year term with PAD. Garrison is returning to his business interests in Brazil.

Joseph F. Harrington, geologist for the U. S. Geological Survey, is en route to Bogota, Colombia, on a Point Four assignment at the request of the governments of Colombia and Ecuador. He will serve as technical advisor on mineral resources development through the Institute of Inter-American Affairs.

A. C. GOLDEN

Albert C. Golden, Jr., has resigned as manager of Pan American Gas Co. and has been elected a director and vice president in charge of operations for Pan American Pipe Line Co. He also has been elected a member of the executive committee of the latter company. **E. V. Hewitt,** operating vice president of Pan American Production Co., has been elected vice president and also has been named to succeed Golden as general manager of operations for Pan American Gas. The three companies are subsidiaries in Texas of Pan American Petroleum & Transport Co.

DEATHS

H. Hales Ross, 78, president of Ross Oils of Alberta, Ltd., died recently in Edmonton, Alta. He was head of an Alberta lumber empire and organized the oil firm 3 years ago. He also was president of Prairie Pipelines, Ltd., a group seeking to export natural gas from Alberta, and was a director of Flank Petroleums.

John Fred Darby, 80, Muskogee, Okla., president of Darby Petroleum Corp., Darby-Lynde Co., and Western Oil Corp., died February 28 in Phoenix, Ariz. He also was a director of Oklahoma Natural Gas Co., of Darby & Bothwell, Inc., Tulsa, and of the Commercial National Bank, Muskogee, Okla. He was one of the organizers and the first president of the Mid-Continent Oil & Gas Association.

Charles E. Artz, Jr., Houston independent oil operator, died February 28 at his home. He formerly had been associated with Carter-Taylor Co. of Houston.

Guy M. Rumbaugh, 71, died February 26 in Mount Carmel, Ill. Rumbaugh was superintendent of the C. B. Shaffer interests in West Virginia when Shaffer brought in the discovery well in Oklahoma's Drumright field. Rumbaugh then moved to Oklahoma to take charge of Shaffer operations. Later he operated as a drilling contractor in Kansas, Texas, and Oklahoma before moving his operations to Illinois in 1939.

John M. Cline, 43, drilling contractor and oil producer of Wetumka, Okla., and Mount Carmel, Ill., was fatally injured in an automobile accident February 25 in southwestern Indiana.

Jesse R. Orth, 52, Midland, Tex., independent oil operator and lawyer, died there February 25.

Robert J. Ryan, 66, machine shop foreman at Mid-Continent Petroleum Corp.'s West Tulsa refinery, died February 28 in a Tulsa hospital.

Max G. Bilsky, 54, oil field supply broker, died in a Tulsa hospital March 3.

Edward Lyle Orr, 65, pioneer Texas oil producer, died recently in Fort Worth.

Frank G. Janeway, 72, who had been an independent geologist since his retirement from the U. S. Corps of Engineers about 2 years ago, died at Tulsa March 4.

Jesse J. Hendershott, 65, Danville, Ohio, driller, died March 1.

Harry S. Elkins, 65, for the past 27 years traffic attorney for the National Petroleum Association, died at his home in Silver Spring, Md., March 1 after an illness of more than a year. Earlier employed by the Interstate Commerce Commission, he joined the N.P.A. in 1925. One of his outstanding contributions to the association was the formulation of the Pipe Line Digest, which it publishes annually.

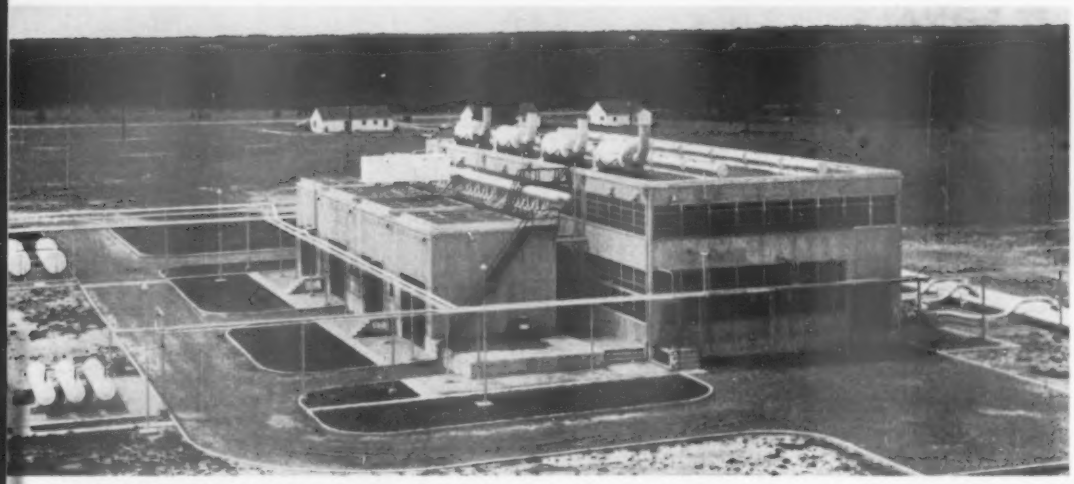
George Kidd, 45, geologist for Humble Oil & Refining Co. for 17 years, died February 28 in Tucson, Ariz.

C. C. McCafferty, 65, retired oil-lease broker, died in a Tulsa hospital March 4.

Joseph E. Magner, Sistersville, W. Va., who had been engaged in the oil-well-supply business in eastern fields since 1892, died February 25. He was widely known in the oil industry in West Virginia, Pennsylvania, Ohio, and Michigan.

Max H. Ernest, Jr., 59, engineer-statistician for Oklahoma Natural Gas Co., died March 4 at his home in Tulsa.

Charles E. Malley, Jr., 41, manager of communications for The Texas Co., died February 23 in Suffern, N. Y., following a heart attack.



COMPACT STATION DESIGN is a feature of Trunkline Gas Co.'s compressor stations. Fan units, driven by gas-engine power takeoff, are housed in low structure at left, while compressors are in main building at right. Note horizontal exhaust mufflers on building roof.

HERE'S EFFICIENT "SPACE ENGINEERING"

Trunkline Stations Models of Compactness

All piping, including main lines, auxiliary lines, conduit and wire, is placed aboveground, either on concrete piers or on overhead stanchions

by F. Lawrence Resen
Gulf Coast District Editor

COMPACT is the word for compressor stations on Trunkline Gas Co.'s 26-in. natural-gas pipe line from McAllen, Tex., to Tuscola, Ill.

Layout of the stations is such that cooling units for engine jacket water are located immediately adjacent to the compressor buildings, with power takeoffs from each engine running to individual cooling fans.

Meanwhile the exhaust mufflers, usually found located in the space occupied by the cooling units, are mounted on the flat roof—another innovation—of the compressor building.

Utilization of existing structures has been carried an additional step, with the space between cooling-unit bays being devoted to fuel-gas meter runs, storage use, and washrooms. An additional feature of the stations has been the piping arrangement, having all main lines as well as utility lines aboveground, either on concrete piers or overhead stanchions.

Station location . . . Trunkline's main line has four 8,000-hp. stations located at Longville and Epps, La.; Independence, Miss.; and Joppa, Ill. Station layout is essentially identical, with the exception that the Longville station has two incoming lines: a 20-in. line from Louisiana fields and a 24-in. line from Texas fields. Both of these lines swage to 26-in. as they join the station's yard piping. Each of the stations has four 2,000-hp. compressor engines.

Station design calls for the gas engines to supply all of the power with the exception of lighting and small electric-motor loads for various auxiliary station needs. In addition to their main task in providing power for compressing the gas, the engines drive cooling-unit fans through shafting arrangements, and motivate cooling-water pumps which are connected directly to the engines.

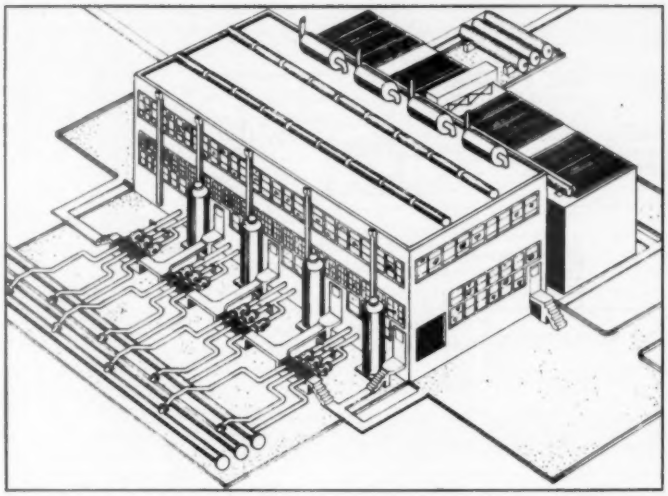
Cooling system . . . One of the most interesting features of the station design is the jacket-water cooling system provided for each individual compressor engine. The cooling units are air-type exchangers which pass 170,000 cu. ft. per minute of air at full load by means of a 14-ft.-diameter fan, driven by the gas engine.

The gas engines are arranged parallel to each other, with cooling bays located directly behind each engine in a structure at the rear of the compressor building. Power is transmitted through a V-belt drive from a sheave mounted on flywheel to shafting which runs to gear box on the fan units.

Sheave ratios are such that at rated full load on the engines the input end of the shaft rotates at 1,750 r.p.m. and transmits this motion to an adjustable fluid coupling located near the engine end of the shaft arrangement. The remaining portion of the shafting consists of necessary pillow blocks for support and flexible couplings. The shafting terminates in a right-angle gear box and is set in a concrete trench covered with grating and running under the walkway in back of the compressor building.

Concrete foundations for the shaft drives and the fan units were poured separately from the engine foundations to minimize vibrational stresses which might be set up by the various units.

Automatic features . . . Two automatic features are employed in maintaining a constant predetermined engine inlet



Sketch of compressor station at Longville, La., showing inlet and outlet manifolds to the compressors.

jacket-water temperature. The first is accomplished through variable fan-speed control, while the second utilizes a piping bypass arrangement.

As the jacket-water heating load or ambient temperature or both increase, the fan speed rise is proportionate to keep pace with the changing condition. Similarly, as forced-draft cooling requirements fall off, the fan speed decreases. Fan-speed regulation is maintained through the use of a fluid coupling. The output speed of the hydraulic torque converter is determined with a temperature controller which air-operates a diaphragm motor connected by linkage to the coupling's speed-control lever. Depending on engine jacket-water cooling requirements, the fan speed developed from the coupling through a 7.394:1 ratio right-angle geared speed reducer, will range from 0 to 237 r.p.m. By utilizing stepless fan speed control, the horsepower needed to operate the assembly is held to a minimum.

When the engine's cooling needs drop below the scope of the fan, a bypass assumes control and maintains a constant jacket-water temperature by diverting the correct quota of outlet water to the intake side of the unit. The commingling of the inlet and bypass streams produce the desired engine jacket-water temperatures. This bypass, positioned at the junction of the engine's outlet and bypass lines, consists of a butterfly-valve arrangement. The butterfly is air-activated by a jacket-water temperature instrument.

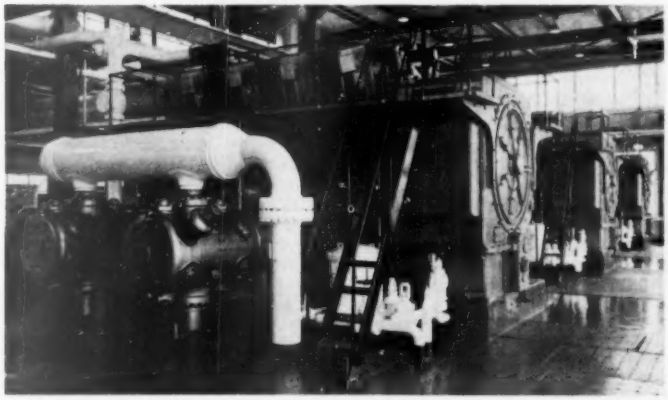
Lube - oil - temperature regulation is achieved by passing the lubricant through heat exchangers which are cooled by suction gas to engines. One exchanger is provided for each individual engine. They are U-type exchangers with oil on the shell side.

Exhaust mufflers . . . With the conventional location of exhaust mufflers at the rear of the compressor building occupied by the fan units, it was planned to use the flat roof of the building for supporting the snubbers. In addition to maintaining the compactness of design, the horizontal muffler installations require simple maintenance and are very open to inspection on the flat-type roof. Roof mufflers also reduce noise level and unwanted heat radiation from the lower operating area of the station.

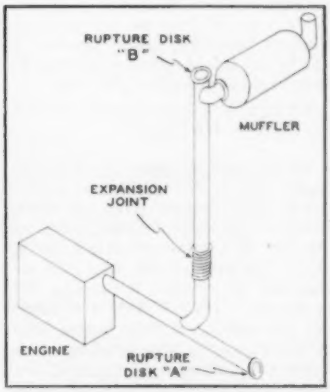
The exhaust system for each engine consists of (1) a horizontal line extending out of the compressor building and capped by a rupture disk; (2) a vertical riser to the roof of the building which is also capped by a rupture disk and includes an expansion joint—this connects to the horizontal line by means of a 45° length of exhaust pipe; and (3) the horizontal muffler which ties into the riser on the roof.

The particular exhaust system provides added protection to the muffler in that, in the event of an engine backfire, the main force of blowbacks will be directed at the two rupture disks and will not directly affect the muffler. Simple replacement of the disks will be all that is required to repair the exhaust system under these conditions, as compared to the expensive repair of

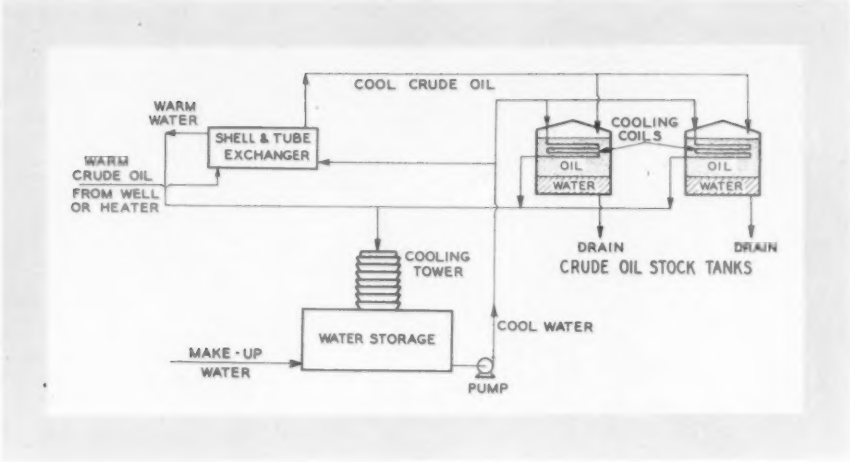
(Continued on page 112)



Three of the four 2,000-hp. engines located at the Longville, La., station are seen in this view. Each station has 8,000-hp. capacity for handling 250,000,000 cu. ft. of gas per day. Compressors used at the four stations on the McAllen-Tuscola route were furnished by Cooper-Bessemer Corp. and Clark Brothers Co., Inc.



Unusual arrangement is used for main engine-exhaust systems in Trunkline stations. Two rupture disks insure against excessive exhaust back pressure.



CRUDE-OIL COOLING SYSTEM for reduction of evaporation losses. Fig. 1.

ECONOMICS OF

Reducing Crude-Oil Vaporization Losses

Total cost of cooling system	$888.00
Reduction in evaporation losses, per day	$ 31.50
Payout time	28 days
Five-year savings	$56,000

by I. A. El-dib* and R. L. Huntington†

CRUDE-OIL-VAPORIZATION losses from storage tanks can in some cases be reduced considerably by cooling the oil prior to sending it to lease-tank storage.

Total installed cost for the cooling system in a typical Mid-Continent application is $888. Reduction in evaporation losses of crude oil due to installation of the cooling system amounts to $31.50 per day. Payout on this system, then, is accomplished in 28 days.

Savings for a 5-year period amount to more than $56,000.

A typical field problem . . . A certain lease is making 500 bbl. per day of 40° A.P.I. Mid-Continent crude oil which leaves the emulsion treating system at 140° F. It is estimated that a saving of 2.5 per cent of the daily production can be effected by cooling the crude oil to 100° F. before it enters the atmospheric storage tanks. This cooling is to be accomplished by countercurrent heat exchange against 80° F. water from an atmospheric cooling tower (Fig. 1).

Some of the more important variables to be considered in designing the exchanger and cooling tower are as follows:

1. Amount of cooling water to circulate.
2. Number of passes and linear velocities for oil and water.
3. Length and diameter of exchanger shell.
4. Size and kind of tubes in exchanger.
5. Power cost for pumping oil and water.
6. Cooling tower cost.
7. Assume the following cost data and tube size:

(a) Cost of heat exchanger = $5.00/ft.^{2} based on outside tube area.

(b) Cost of cooling tower = $1.50/ft.^{3}

(c) Cost of power = $0.005/kw.-hr.

(d) Cost of makeup water = $0.1/1,000 gal.

(e) Tube size ⅝-in. i.d. and ¾-in. o.d. admiralty metal.

The emulsion of crude oil and water provides (in most cases) a very poor cooling medium for the hot treated crude oil. It has been found that the fluid which offers the most dependable cooling medium is fresh water from a river, well, or cooling tower. Throughout the Mid-Continent and the Gulf Coast fresh-water supplies are usually so limited that cooling towers are mandatory.

Solution—Method of Attack

The ideal approach to such a problem would be that of setting up a differential equation in terms of either the most economical exit water temperature or the most economical tube length. But since both the heat exchanger and the cooling tower are being designed as one unit (see Fig. 1) rather than the exchanger by itself, the trial-and-error method of attack is more amenable.

This approach is not as difficult in this case as setting up a differential equation with its many approximations.

Outline of method . . . The following steps are used in determining the economics of the system:

1. Make a heat balance around the exchanger.
2. Assume different water velocities

*Of Cairo, Egypt, candidate for Ph.D. degree in chemical engineering, University of Oklahoma, and †chairman, School of Chemical Engineering, University of Oklahoma, Norman.

such as 2, 4, 6 ft. per second and calculate the over-all coefficient of heat transfer for each of these velocities.

3. Assume exit-water temperatures of 85°, 90°, 95°, 100° F. and from these and the assumed velocities find the respective areas of the 12 heat exchangers.

4. Calculate the number of tubes in each exchanger for the different velocities and temperature drops of water.

5. Calculate the length of the tubes from the areas of these several exchangers.

6. Calculate the cost of each exchanger, based on the area.

7. Calculate the pressure drop through the shell and the 5-year cost of pumping the oil through the shell, for the different heat exchangers.

8. Calculate the 5-year cost of pumping water through the tubes for the different heat exchangers.

9. Design a cooling tower and figure its cost on basis of cubic feet of tower volume for each of the four exit-water temperatures.

10. Add to each exchanger the approximate amount of $200 for pumps + $32.50 for piping + $55.50 for water losses by evaporation + cost of water entrainment losses.

11. The total cost of each design is:
(a) Cost of exchanger based on $/ft.² of exchange area.
(b) Cost of pumping oil on the shell side for 5 years.
(c) Cost of pumping water through the tubes for 5 years.
(d) Fixed cost of pumps and piping.
(e) Cost of water used.
The most economical heat exchanger will appear from these summations.

12. Determine how long it will take the exchanger to pay for itself, and how much money it will save in 5 years of operation if, otherwise, $31.50 per day is lost due to evaporation of lighter fractions from the crude oil.

Solution in Detail

1. Heat removed from oil per hour

$$\text{Oil in} = \frac{500 \times 42}{24} \times 8.33 \times 0.8$$

$$= 5{,}830 \text{ lb./hour}$$

$$Q = 5{,}830\ (140 - 100) \times 0.495$$
$$= 115{,}500 \text{ B.t.u./hour}$$

2. Assume the water flows through the tubes at velocities of 2, 4, and 6 ft. per second and calculate the over-all coefficient of heat transfer H from the equation:

$$H = \frac{1}{\frac{1}{h_o} + \frac{1}{h_i} + \frac{L}{K} + F_o + F_i}$$

where:

h_o = film coefficient on the outside of tube in B.t.u. per hour per sq. ft. per °F. (See Nelson Petr. Rfg., p. 501)

h_i = film coefficient on the inside of tube in B.t.u. per hour per sq. ft. per °F. (See Nelson Petr. Rfg., p. 502)

L = thickness of tube in feet. (Given in problem)

K = conductivity in $\frac{\text{B.t.u.} \times \text{ft. of thickness}}{\text{hr.} \times \text{ft.}^2 \times {}^\circ\text{F.}}$

(See Nelson Petr. Rfg., p. 477)

F_o = fouling factor outside of tube. (See Nelson Petr. Rfg., p. 492)

F_i = fouling factor inside of tube. (See Nelson Petr. Rfg., p. 491)

Sample calculation:

$$\text{Summation of resistances} = \frac{1}{125} + \frac{1}{590} + \frac{0.063}{12 \times 25} + 0.0017$$

$$+ 0.004 = 0.0156$$

$$H = \frac{1}{0.0156} = 64$$

TABLE 3—AMOUNT OF WATER FOR DIFFERENT TEMPERATURE RISE5

Temp. rise of water outlet-inlet temp.	Lb. of water/hour	Ft.³/sec.
5	23,100	0.1030
10	11,550	0.0515
15	7,690	0.0342
20	5,775	0.0257

Cross-sectional area of tube

$$= \frac{\pi D^2}{4} = \frac{\pi \times 0.625 \times 0.625}{4 \times 144}$$

$$= 0.00213 \text{ ft.}^2$$

To calculate the number of tubes:

$$= \frac{\text{Charge}}{\text{Area of tube} \times \text{velocity in ft./sec.}}$$

$$= \frac{\text{ft.}^3/\text{sec.}}{\text{ft.}^2 \times \text{ft./sec.}}$$

Sample calculation:

$$\text{Number of tubes} = \frac{0.1030}{0.00213 \times 2} = 24.2$$

TABLE 1—OVER-ALL HEAT-TRANSFER RATES

Water velocity, ft./sec.	h_o	h_i	F_o	F_i	$K_{1\text{-in.}}$	H
2	125	590	0.0017	0.004	25	64
4	240	1,075	0.0017	0.003	25	100
6	320	1,430	0.0017	0.0025	25	122

3. Assume exit-water temperatures of 85°, 90°, 95°, 100° F.

Sample calculation:

$$\text{Log mean temperature} = \frac{(140 - 85) - (100 - 80)}{\ln \frac{55}{20}} = 34.6^\circ \text{ F.}$$

$$Q = \text{A. U. } (\Delta T) \text{ avg.}$$

$$A = \frac{115{,}500}{64 \times 34.6} = 52.2 \text{ ft.}^2$$

TABLE 2—AREA OF EXCHANGERS

H	Area, sq. ft.			
64	52.2	54.9	58.4	62.5
100	33.4	35.2	37.4	40.0
122	27.4	28.8	30.7	32.8
Logarithmic mean temperature difference, °F.	34.6	32.8	30.9	28.9
Exit-water temperature, °F.	85	90	95	100

4. To calculate the amount of water required for each temperature rise:

Sample calculation:

$$Q = 115{,}500 = M \times C_p \times \text{temp. rise}$$

$$M = \frac{115{,}500}{1 \times (85 - 80)} = 23{,}100 \text{ lb./hour}$$

TABLE 4—NUMBER OF TUBES IN EACH EXCHANGER

ΔT, °F. outlet-inlet temp.	Water velocity, ft./sec.		
	2	4	6
	Calculated number of tubes		
5	24.2	12.1	8.1
10	12.1	6.05	4.03
15	8	4.015	2.68
20	6.03	3.02	2.01

5. Outside area of tube/ft. length (¾-in. o.d.) tubing

$$= \frac{1 \times \pi \times 3}{4 \times 12}$$

$$= 0.196 \text{ ft.}^2/\text{ft. of tube length}$$

$$\text{Linear ft./ft.}^2 = \frac{1}{0.196}$$

$$= 5.1 \text{ ft./ft.}^2 \text{ of outside area}$$

Sample calculation:

If exchanger area = 52.2 ft.² and the number of tubes in that exchanger are 24.2, what is the length of each tube?

$$\text{Length of tube} = \frac{52.2 \times 5.1}{24.2} = 11 \text{ ft.}$$

TABLE 5—LENGTH OF TUBE IN EACH EXCHANGER

Water-temp. rise outlet-inlet temp.	Water velocity, ft./sec.		
	2	4	6
	Calculated tube length, ft.		
5	11	14.1	17.5
10	23.1	29.7	36.75
15	37.2	47.6	78.30
20	53.2	67.5	83.70

6. Cost of exchanger based on $5.00/ft.² of area:

Sample calculation:

Cost of exchanger of 52.2 ft.² area = 52.2 × 5 = $260.00.

TABLE 6—COST OF EXCHANGER IN DOLLARS

H				
64	$260	$274	$292	$313
100	167	176	187	200
122	137	144	153.5	164
Logarithmic mean temp., °F.	34.6	32.8	30.9	28.9
Exit water temp., °F.	85	90	95	100

7. Calculation of the pressure drop for the crude oil on the shell side. Reference, "Petroleum Refining Engineering" by W. L. Nelson, p. 509.

$$\Delta P = \frac{0.323\, fs\, (Nu)^2\, NL}{Kp}\left(A + 5\frac{D}{X}\right)$$

where

p = space between tubes, in.
K = a constant which ranges from about 2 for closely spaced baffles to 2.25 for very few or no baffles
ΔP = pressure drop, psi.
L = length of bundle, ft.
N = number of shell passes
A = a constant which depends upon velocity; ranges from 0.5 for the lowest velocities to 3 at the highest velocities see Nelson Petr. Rfg., p. 500)
X = baffle spacing, ft.
u = average velocity, ft./sec. (see later)
f = friction factor (Fig. 134, P.R.E.), Kpus/Z
D = inside diameter of shell, ft.

where D can be calculated as follows:

$$D = [(1.25\, d + 1/4)\, n + d + 2]/12$$

where

d = pitch, distance of center to center line of tubes
n = maximum number of tubes in a row
d + 2 = an additional spacing for distance between tube at the outside and shell

and

$$u = \frac{G}{13{,}000\, D^2}(A + D/X)$$

where

u = velocity, ft. per sec. around the tubes
G = rate of flow, gal. per hour
D = inside shell diameter, ft. (or more exactly, the length of cross travel across the shell due to baffles)
X = baffle spacing, ft.

Sample calculation of u (linear velocity)

$$G = \frac{500 \times 42}{24} = 874 \text{ gal./hour}$$

$$u = \frac{874 \times 144}{13{,}000 \times (8.2)^2}\left(0.5 + \frac{8.2}{0.5 \times 12}\right)$$

$$= \frac{0.0672 \times 144}{(8.2)^2}(1.868) = 0.28 \text{ ft./sec.}$$

$$p = \frac{0.323 \times 0.011 \times 0.8 \times (0.28)^2 \times 1 \times 11}{2.25 \times 0.437} \times \left(0.5 + \frac{5 \times 8.2}{12 \times 0.5}\right) \times 144$$

$$= 2.52 \text{ lb./ft.}^2$$

The oil charge = 117 ft.³/hour

$$\text{Work} = \frac{\text{ft.}^3}{\text{hour}} \times \frac{\text{lb.}}{\text{ft.}^2} = \text{ft. lb./hour}$$

Work = 2.52 × 117 = 297 ft. lb./hour

1 kw.-hr. = 2.655 × 10⁶ ft. lb.

$$\text{Cost in 5 years} = \frac{297 \times 2.4 \times 5 \times 365}{2.655 \times 10^6} \times 0.005 = \$0.0245/5 \text{ years}$$

8. To calculate the cost of pumping of water inside tubes:

$$\Delta P = \frac{2\, f\, l\, \rho V^2}{32.2\, D}$$

where

D = diameter in ft.
f = friction factor from Reynolds' number (Perry Chem. Engr. Handbook, p. 941)
l = length of tube in ft.
ρ = density, lb./ft.³
V = average velocity in feet per second

9. Design of the cooling tower:

Assuming the relative humidity of the atmosphere = 30 per cent. At 100° F. air temperature, and 30 per cent relative humidity—Brown Unit Operations, p. 545—saturation or wet-bulb temperature is 75° F. Also if 35-ft. height of tower has 12 decks, then a 15-ft. height tower has x decks.

$$x = \frac{12 \times 15}{35} = 5 \text{ decks}$$

Sample calculation from Brown Unit Operations, p. 545:

For 20° F. drop in water temperature through the tower, the capacity in gal./min./ft.² at 70° F. wet bulb-temp., 3 m.p.h. wind velocity, 35 ft. height tow-

TABLE 7—PRESSURE DROP ON SHELL SIDE AND PUMPING COST

Exchanger corresponding to length of tubes, ft.	Calculated No. tubes per exchanger	Diam. of shell, in.	Nominal diam. of shell, in.	Calculated velocity through shell, ft./sec.	Reynolds' number	Friction factor	ΔP lb./ft.²	Discharge ft.³/hr.	Work, ft. lb./hr.	$/5 years
11	24.2	7.981	8.2	0.28	0.69	0.011	2.52	117	297	0.0245
14.1	12.1	6.065	5.8	0.399	0.74	0.0105	4.91		575	0.0474
17.5	8.1	5.047	4.6	0.512	0.795	0.0102	8.31		972	0.0801
23.1	12.1	6.065	5.8	0.399	0.740	0.0105	8.05		939	0.0724
29.7	6.05	5.047	4.6	0.512	0.795	0.0102	14.00		1,638	0.1350
36.75	4.03	3.548	3.5	0.838	0.915	0.0101	33.80		3,950	0.226
37.2	8.03	5.047	4.6	0.512	0.795	0.0102	17.55		2,050	0.169
47.6	4.015	3.548	3.5	0.838	0.915	0.0101	43.7		5,110	0.422
78.3	2.68	3.548	3.5	0.838	0.915	0.0101	72.0		8,450	0.697
53.7	6.03	5.047	4.6	0.512	0.795	0.0102	25.40		2,965	0.2445
67.3	3.02	3.548	3.5	0.838	0.915	0.0101	64.6		7,550	0.623
83.7	2.01	3.548	3.5	0.838	0.915	0.0101	79.6		9,300	0.767

TABLE 8—PRESSURE DROP IN TUBES AND COST OF PUMPING

Length of tube, ft.	Arithmetic mean temp. of water in °F.	Velocity, ft./sec.	Density, lb./ft.³ in accord. with temp. change	Viscosity, ft. lb./sec.	Reynolds' No.	Friction factor	ΔP lb./ft.² per tube	ΔP × No. of tubes	Ft.³/sec. for all tubes	Ft. lb./hr.	$/5 yr.
11	82.5	2	62.2	.000588	13,700	.007	18.9	453	.1030	168,000	39.60
23.1	85	2	62.17	.000571	13,600	.007	39.7	477	.0515	88,500	20.85
37.2	87.5	2	62.14	.000554	14,070	.007	63.8	510	.0342	62,800	16.67
53.2	90	2	62.10	.000537	14,450	.0069	91.3	1,096	.0257	101,500	23.93
14.1	82.5	4	62.2	.000588	26,400	.006	83.5	501	.1030	185,500	43.60
29.7	85	4	62.17	.000571	27,700	.006	176.1	704	.0515	130,700	32.40
47.6	87.5	4	62.14	.000554	28,040	.0059	282	1,130	.0342	139,240	32.80
67.5	90	4	62.10	.000537	28,000	.0059	400	1,200	.0257	111,200	27.65
17.5	82.5	6	62.20	.000588	39,600	.00515	201	1,608	.1030	595,000	140.5
38.75	85	6	62.17	.000571	40,800	.00515	421	1,684	.0515	317,300	73.6
78.3	87.5	6	62.14	.000554	42,060	.00515	897	1,794	.0342	214,700	50.5
93.7	90	6	62.11	.000537	43,350	.00515	970	1,940	.0257	179,700	42.30

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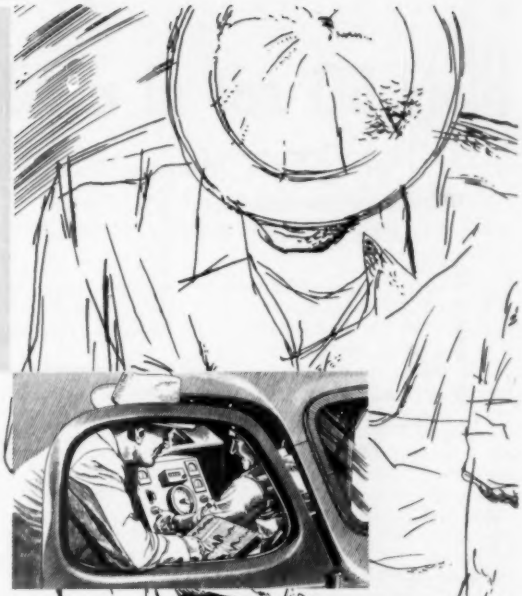

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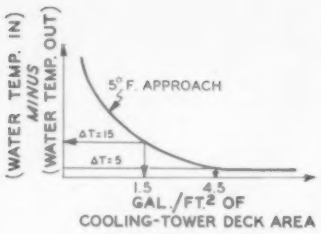


Fig. 2

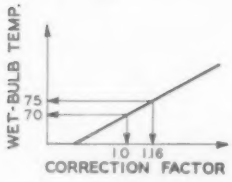


Fig. 3

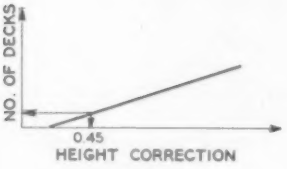


Fig. 4

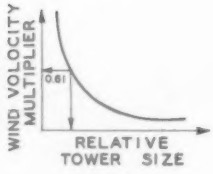


Fig. 5

er, from Fig. 511, p. 555. From chart, capacity

$$\therefore \text{Gal./min./sq. ft.} = 1$$

Several corrections are introduced to adapt the last figure to the actual operating conditions

$$\therefore \text{Gal./min./sq. ft. of cross-sectional area} = 1 \times 1.16 \times 0.45 \times \frac{1}{0.61} = 0.855$$

$$\text{Actual area needed} = \frac{11.5}{4.55 \times 0.855}$$

$$= 13.45 \text{ ft.}^2$$

TABLE 9—COOLING-TOWER COSTS

Temp., °F.	Lb. water/ hr.	Gal./ min.	Gal./ ft.² of deck area	Area/ deck, sq. ft.	Cost of tower
5	23,100	46.2	4.55	11.9	$268
10	11,550	23.1	1.57	17.25	388
15	7,690	15.4	1.2	15	337
20	5,775	11.5	1.0	3.45	302

TABLE 11—OVER-ALL COST FOR DIFFERENT EXCHANGERS
(Time basis—5 years' operation)

	Proposed exit water temp., °F.	Velocity, ft./sec.	Exchanger cost, $	Cost of pumping water, $/5 yr.	Cost of pumping oil, $/5 yr.	Cost of tower, $	Cost of piping, $	Cost of pumps and water loss	Cost of water lost by entrainment	Total cost, $
1.	85	2	260	39.60	0.0245	268	32.50	255.40	121.5	977.00
2.	90	2	274	20.85	0.0474	338			60.8	981.60
3.	95	2	292	16.67	0.0802	337			40.4	974.05
4.	100	2	313	23.93	0.0774	203			30.3	1,048.40
*5.	85	4	167	43.60	0.135	268			121.5	888.14
6.	90	4	176	32.40	0.326	338			60.8	895.44
7.	95	4	187	32.80	0.169	337			40.4	885.22
8.	100	4	200	27.65	0.422	302			30.3	848.77
9.	85	6	137	140.50	0.697	268			121.5	955.60
10.	90	6	144	73.60	0.2445	338			60.8	904.54
11.	95	6	153.5	50.50	0.623	337			40.4	869.92
12.	100	6	164.0	42.30	0.767	302			30.3	826.50

*Optimum exchanger cost.

Sample calculation of tower cost:

Volume of tower = 15 (height) × 13.45 (area/deck) = 201.2 ft.³

Cost of tower = 201.2 × $1.5 ($1.5/ft.³) = $302.00

10. (a) The price of makeup water:

$$\text{Lb. of water used/hour} = \frac{115{,}500}{1{,}096} = 105.4 \text{ lb./hour}$$

$$\text{Cost of water used in 5 years} = \frac{105.4 \times 24 \times 365 \times 5 \times 1}{8.33 \times 1{,}000 \times 10} = \$55.40$$

(b) The cost of piping:
105 ft. of 2-in. pipe are used at the rate of 31 cents per ft.

Cost of piping = 105 × 0.31 = $32.50

(c) The cost of pumps:
A fairly good figure for the cost of two pumps = $200.00.

(d) The cost of water due to entrainment:
1 per cent of the total water circulated was lost due to entrainment. Cost in 5 years:

Sample calculation:

$$\text{Cost} = \frac{23{,}100 \times 24 \times 365 \times 5}{8.33} \times (0.01) \frac{0.1}{1{,}000} = \$121.50$$

TABLE 10—COST OF WATER DUE TO ENTRAINMENT AND EVAPORATION

ΔT °F.	Lb of water/ hr.	Water cost in 5 yr.
5	23,100	$121.50
10	11,550	60.80
15	7,690	40.40
20	5,775	30.30

11. The over-all cost of exchanger

= $ cost of exchanger
+ cost of pumping water/5 years
+ cost of pumping oil/5 years
+ cost of cooling tower
+ cost of piping
+ cost of pumps
+ cost of water losses by evaporation
+ cost of water losses by entrainment

$ Total cost of exchanger

Although exchanger No. 12 appears to be the most economical, tube length is excessive and exchanger diameter is unduly small due to the small number of tubes involved. Taking these factors into account, the most practical exchanger is No. 5, in which 12 tubes, each 14 ft. long, are used. Flow is single pass through the tubes.

Reduction in evaporation losses of oil due to the installation of the cooling system amounts to $31.50 per day. The exchanger will pay out in 888.14/31.5 = 28 days. Losses due to evaporation for 5 years are 31.50 × 365 × 5 = $57,500. The proposed exchanger will save $57,500 — 888 = $56,611 in the 5-year period.

No attention was given in this study to the problem of corrosion of exchanger tubes. This matter should receive detailed study in some areas.

One other possibility for the exchanger is the use of atmospheric sections installed in the base of the cooling tower. This would eliminate the exchanger shell and some piping.

BOOK

ECONOMICS OF NATURAL GAS IN TEXAS. By John R. Stockton, Richard C. Henshaw, Jr., and Richard W. Graves. Published by Bureau of Business Research, College of Business Administration, University of Texas. 316 pp. $5.

Although this study emphasizes the place of Texas natural gas in the over-all national picture, it will prove most interesting to persons concerned with any phase of the economic problems of energy sources in the world. Much information about oil, coal, water power, and atomic energy is included to point out the relationship which exists between natural gas and the other fuels. The book was written with the aim of presenting a comprehensive, factual treatment of the economic problems facing the natural-gas industry. These problems are unseparable from the technical ones, and an effort has been made to provide the reader with sufficient description of the technology to enable him to understand and appreciate the economic problems contained therein. The book is illustrated with numerous maps, charts, and tables.

HOW TO OPERATE AND MAINTAIN

Hydraulic Units in the Oil Field

by E. L. Phillips

Operation of these growingly popular units is quickly mastered, being similar to that of straight mechanical drive. And maintenance is a matter of routine checking.

THE past 4 years have been the beginning of a new era in oil-field power transmission. As drilling depths increase, the demand for more and more hoisting capacity and slush-pump capacity puts a premium on available rig horsepower. In order to preserve rig portability and consequent fast rig-up time it is important that a maximum of the installed horsepower be made available.

Hydraulic drives constitute a means to that end. By minimizing shock loads and torsional vibration these units enable the engines to realize their maximum effectiveness on the rig. In the case of the torque converter the available torque is multiplied to several times that developed by the engines. The hoisting cycle is thereby accelerated, since, in effect, each successive stand pulled out of the hole is hoisted in a slightly "higher gear" than the preceding one.

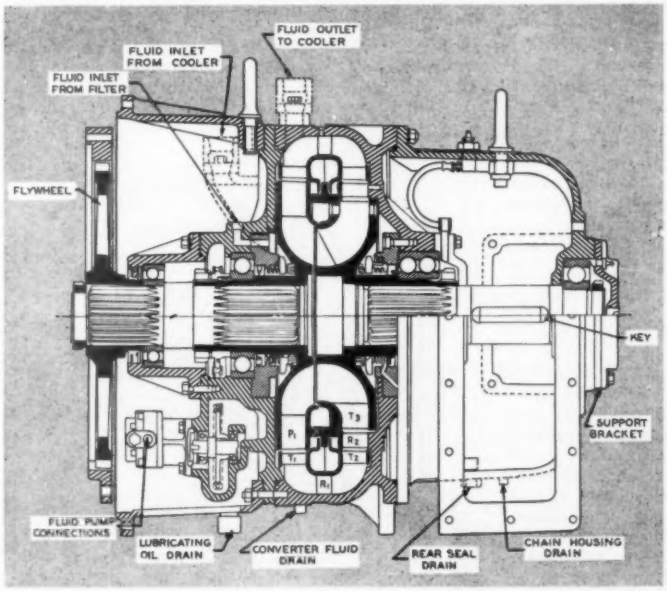
Unfortunately, these advantages are obtained only if the drives are properly maintained in order that they render a satisfactory service life. However, the maintenance itself is simple and can be boiled down into half a dozen simple and periodic chores which will be discussed.

Hydraulic couplings . . . In the case of hydraulic couplings, operation of the rig is very much the same as with the straight mechanical-drive rig. The principal difference is that the clutches may be engaged with the engines idling. Due to the high degree of slip in the coupling during load acceleration, there is no worry that the engine will stall. The load is accelerated smoothly and steadily to maximum speed.

Due to the unaccustomed slip, a driller operating a coupling-equipped rig for the first time will probably think his hoisting clutch is slipping. He will soon become accustomed to the slow, smooth start, however, and learn to open the throttle wide immediately after elevators are latched and clutch engaged. He will find that he loses less time in the hoisting cycle due to less use of the inertia brake and to reduced shock.

Fishing jobs are made somewhat easier by use of the hydraulic coupling. It is possible to suspend any load the rig is capable of hoisting by means of the throttle only. The brake lever can be thrown back and the throttle played back and forth to work the pipe up or down an inch at a time if desired. The same possibility holds true in the case of pulling on stuck drill pipe. The sensitivity of the pull is limited only by the sensitivity of the throttle. When the maximum desired pull is reached it can be maintained by the throttle and slacked off at will again by the throttle alone.

When the load is stalled, however, all the horsepower being delivered into the coupling is converted into heat. The heat exchanger or radiator normally furnished with the unit is designed to absorb 30 per cent of engine capacity in heat. As a result continued stalling of the coupling with more than 30 per cent of peak engine horsepower being developed will result in overheating. Fortunately, the condition will seldom arise when more than a third of the rig horsepower will be required to work stuck pipe. Nevertheless, it is a point to be remembered in connection with both the coupling and the torque converter. The cooling systems are of like capacity.



THREE BASIC PARTS comprise this torque converter: the pump or impeller, marked P_1; the turbine, marked T_1, T_2 and T_3; and the stator or housing with its reaction blading marked R_1 and R_2. The engine drives the pump which forces fluid outward against the first impeller blades; the fluid then passes through reaction blading where it is redirected by the second set of reaction blading and strikes the third turbine stage. Fluid is then picked up by the pump for another passage through the cycle. Torque is multiplied by the fluid striking the turbine blading at the optimum angle, being directed by the reaction blading. Fig. 1.

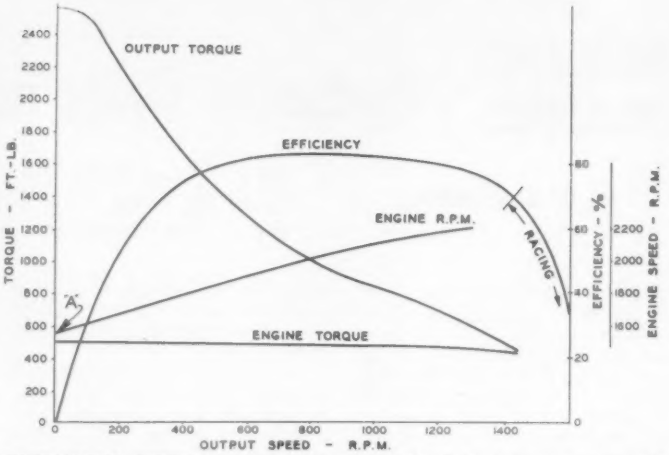
Torque converters . . . Operation of a torque-converter rig is somewhat different from that of a straight mechanical rig. Some training of the drilling crews is necessary, and while

the training is simple and brief it is nevertheless necessary to successful operation of the rig.

The converter shown in Fig. 1 is manufactured by Twin Disc Clutch Co. It is a three-stage unit capable of multiplying engine torque approximately five times when the throttle is wide open and the output shaft stalled. It thus is able to accelerate a given load even more smoothly than the hydraulic coupling. As the hoisting speed approaches maximum the torque multiplication reduces to one and the speed of the output shaft reaches a maximum of about 80 per cent engine speed. The 20 per cent loss of revolutions per minute is reflected in heat within the converter and is absorbed by the cooler.

The chief difficulty experienced in training a crew to operate converters is that of getting them to recognize when to change gears in the transmission. Fig. 2 is a typical torque-converter efficiency curve. As the output shaft reaches a certain speed the efficiency drops rather abruptly. This condition is quite often realized when drilling at shallow depth and is known as "racing." Since the converter efficiency is below 70 per cent, the converter will heat, even though the load is relatively light. More than 30 per cent of engine horsepower is being changed to converter heat. A number of service calls based on the report that the converters were running hot while shallow hole was being dug are a result of the heating under light load.

There are two means of preventing this temporary heating. Both means result in loading the converters so that the output shaft slows down and the efficiency gets back above 70 per cent. First, on a three-engine rig one motor can be shut down until the other two become loaded to the point that the third is really needed. Second, and preferable, a higher transmission speed is selected for the rotary table and the motors slowed down. This, of course, will result in slower pump speed, but manufacturers of converter rigs have taken care of the problem by designing the pump drive to accommodate tailshaft speeds of 650 to 700 r.p.m. instead of usual 900 to 1,000 r.p.m. The slush pump therefore does not suffer for lack of speed.

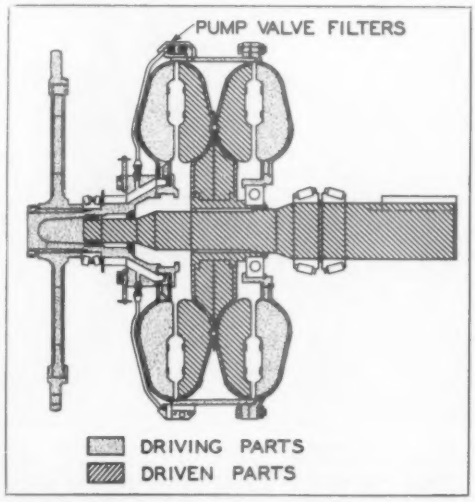


GENERALIZED CURVES for torque-converter operation. Point A is the converter stall point mentioned in the text. The 70 per cent efficiency points are marked, outside of which converter heating will occur. Fig. 2.

Characteristics of operation . . . Another difficulty often experienced with drillers unfamiliar with torque converters is that he feels he isn't getting any power out of the units. This is more often true on diesel rigs than on gas-engine rigs. Invariably, the driller eases the throttle forward and expects the pipe to accelerate very rapidly.

Actually, the throttle should be opened wide to allow the engines to develop full power as rapidly as possible. The converter will take care of the shock attendant to sudden throttling. **The hydraulic unit can never deliver more horsepower than the engine puts into it.** Therefore, the operator of a converter rig should always look to his engine first when he suspects a lack of power somewhere.

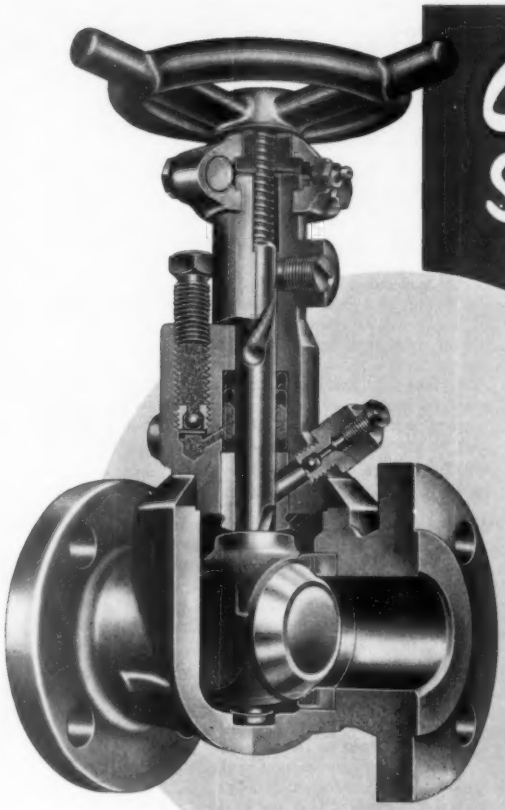
Numerous service calls have been made because the operator was unable to get any performance out of the converter even though his throttle manipulation was as it should be. In the majority of cases the engine was in need of tuning. It was either out of time or running with too low a governor setting. In either case, of course, the full horsepower capacity of the engine would not be developed. Since the converter is sized to the full engine horsepower, any sizable reduction in the engine output horsepower will have a serious effect on converter output.



SECTION through a disconnecting type of fluid coupling. Disconnection is done by dumping fluid from the coupling proper. Fig. 3.

THE AUTHOR

E. L. Phillips, Jr., received his bachelor of science degree in mechanical engineering from John Brown University in 1938, and a bachelor of science degree in petroleum engineering in 1940 from University of Texas. For 6 years he was employed in the producing department of The Texas Co. as a petroleum engineer. Following this time, from 1946 to the present, he has been associated with Vance Supply Co., Odessa, Tex., as partner and engineer. The supply company is Permian basin distributor for Twin Disc Clutch Co., handling its torque converters and fluid couplings, about which the accompanying paper is written.



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When Performance Falters, Check These Spots . . .*

I. Loss of Fluid from Converter

1. Leaky pipe connections:

Check all lines and connections. Be sure no rubbing or excessive vibration is present. Have system under pressure when looking for leaks by operating converter at partial speed.

2. Leaky converter:

Check all bolts and nuts clamping gasketed joints while system is under pressure.

3. Leakage around output shaft or into lube oil chamber:

This may be caused by a mislocated seal gasket which will not allow the seal drain to function. The fluid drain holes in the seal assembly and seal gasket must line up with the drain hole in the housing.

4. Losing oil from lube oil chamber:

This indicates worn charging pump seal, allowing air and oil to be sucked in along pump shaft and forced into main converter chamber.

5. Excessive leakage past seals:

This may be indicated by low gage-pressure, caused by converter fluid entering lube oil chamber or by fluid entering turbine bearing chamber.

6. Overflowing reserve tank:

A damaged charging pump, whether operating or not, may permit fluid to flow back to the reserve tank from the converter. When converter is not operating, fluid could leak through the pump into the reserve tank, since the reserve tank is lower than the converter proper. With the converter operating, but with the pump nonoperative, due to damage such as a sheared pin, fluid could continually be bled into the reserve tank from the radiator's overflowing, the same as if the charging pump were not performing its function of delivering fluid from the reserve tank to the converter. A clogged line from the reserve tank to the pump will not permit the charging pump to pick up fluid, thus causing the tank to overflow. Low gage-pressure is also an indication of the above conditions.

II. Poor Performance and Overheating

1. Air in system:

First, remove orifice filter and clean the filter and orifice hole in the orifice body on the side of the reserve tank to make sure that the fluid is being bled off the system from the top of the radiator or heat exchanger. Replace the filter and start engine.

2. Operating too long in low-efficiency range:

The cooling radiators on the average converter installation have capacity to adequately cool the converter when operating above 70 per cent efficiency; however, when the output shaft speed is pulled down below a predetermined point or goes above another point (this varies with various engines), and the engine throttle is still wide open, so that the output horsepower becomes less than 70 per cent of the input horsepower, the cooling capacity of the radiator is exceeded. In the case of low output speed, the next lower gear behind the converter should be engaged to reduce the torque requirements on the converter shaft and allow its speed to build up.

3. Fluid level too low:

Check fluid level in reserve tank with engine and converter running. If fluid level is below full mark on dip stick, add enough to bring level up to this mark.

4. Low basic pressure:

This can be checked by direct reading on the pressure gage. It should read between 45 to 60 psi. Check charging pump drive chain and shear pin. Check oil line from pump to filter. Check for clogged filter. Check main seals and check charging pump relief valve for dirt.

5. Clogged radiator:

Whenever a radiator is used for the direct cooling of the converter fluid, it may become clogged on the outside with dirt, bugs, leaves, etc. In such cases it should be washed and blown out with air. The radiator tubes may be clogged inside with dirt, rust or extraneous matter, and in such cases must be thoroughly cleaned and flushed out. The fan operation should also be checked to see that there is no slipping of the fan belts.

III. Low Output Horsepower

1. Engine not coming up to rated performance:

Place unit in highest gear range and lock brakes so that output shaft of converter is stalled and will remain stalled when engine throttle is opened wide. With the engine throttle wide open and the converter shaft stalled, measure the engine r.p.m. by the use of a speed counter or tachometer. If the engine does not climb up to a predetermined speed (which varies with different engines), it is not developing its full rated horsepower and should be thoroughly checked by the engine mechanic.

2. Improper fluid in converter:

Fluid should correspond to Twin Disc recommendations. A thicker fluid will cause loss of efficiency and output horsepower because it does not flow through the blading as readily as the recommended fluid.

3. Air in system:

Use procedure listed in Paragraph II-B-1.

4. Low basic pressure:

Use procedure listed in Paragraph II-B-4.

IV. Excessive Pressure

Probable cause:

1. Stuck piston in relief valve of charging pump.

V. Grinding or Scraping Noise Inside Housing

This is an indication of bearing failure on pump or turbine, allowing labyrinth seals to rub. Engine should be shut down and the converter disassembled for inspection of bearings.

VI. Failure of Bearings

1. Output shaft bearing—misalignment or too much side load on output shaft.

2. Input shaft bearing—lack of lubricating oil or excessive misalignment.

VII. Noise

In case of slight misalignment between the driving ring and spider, a sharp, squealing noise can be heard coming from the input housing. This noise can be overcome by applying heavy oil or grease to the teeth of the drive spider and driving ring.

*Twin Disc Clutch Co., Maintenance Manual.

It is therefore extremely important to keep converter-equipped engines in tune.

Drilling engines equipped with torque converters or hydraulic couplings should be synchronized, but this is less important with fluid drives than with a straight mechanical rig. While rig power would suffer from lack of synchronization, the clutches, sprockets, and chains would not. Nevertheless, reasonable care should be exercised to keep the engines running together.

The torque converter is a good dynamometer. It is possible to determine very closely whether the engine is putting up its rated horsepower by merely stalling the output shaft and running the engine up to full throttle. For every engine-converter combination there is a definite engine speed for full throttle and stalled converter, shown by Point "A" in Fig. 2. If the speed falls short of this the engine is not developing its full rated power. If the speed exceeds the specified point the converter is at fault. Any time doubt exists as to the source of trouble when output power is lacking this stall-torque test is a sure and easy way to arrive at the solution.

Converter-pump combination . . . One of the most controversial points connected with torque-converter operation on drilling rigs is the matter of slush-pump drives. Several rig manufacturers still have not consented to build a rig with converter-driven pumps. A number of such pumps are in daily operation, however, and are rendering very satisfactory service.

Any slush pump has a lower limit in speed below which it must not be operated under full load. Failure to observe this limit will likely result in a broken pinion shaft or stripped pinion gear. It probably is this point that causes the reluctance on the part of some manufacturers

It is extremely important that the pump speed on a converter rig be maintained at a point above this prescribed minimum. Liner changes, while usually not necessary as frequently with a converter drive, are necessary in order to keep the proper balance between pump speed and pump load.

Every effort should be made to keep pump speed from becoming too low under load.

Hydraulic-Drive Maintenance

Maintenance of hydraulic units is simple and should never be neglected. The Twin Disc disconnecting hydraulic coupling illustrated in Fig. 3 requires a daily check on oil level—this can be done with the engine running. It requires daily greasing of the output bearing. On units equipped with oil filters the filter cartridge should be changed every 2 weeks—more often during the time of sand storms. Beyond these measures there is no maintenance required on the couplings.

Maintenance on torque converters involves very little more. The fluid level in the lubricating-oil chamber and in the torque fluid reserve tank must be checked daily. An orifice assembly, which automatically bleeds entrapped air from the system, contains a fine-mesh screen to catch foreign particles in the fliud and prevent their clogging the small orifice through which the air-laden fluid is bled. This screen should be cleaned every 8 hours for the first day or two after filling the converter. After that it should be checked and cleaned once each day. It is necessary to kill the engine before removing the screen.

The converter temperature gage should be read every hour. Temperature normally should not exceed 225° F. for continuous operation and should **never** be allowed to exceed 250° F. for continuous duty. The best operating temperature is 180° F. and will probably be about average except during extremely hot weather or when ventilation about the converter is very poor.

The filter cartridge should be changed every week, particularly during the sandy season. Fully 75 per cent of all converter failures are directly traceable to sand and grit in the fluid system. It is therefore extremely important that sand be kept out of the units as much as possible.

The sand problem is not as serious as might have been indicated, however, since the auxiliary fluid pump takes suction from the reserve tank through a line that is fitted with a fine-mesh tubular screen through which the fluid must pass before leaving the tank. The pump discharges directly through a filter from which the oil goes into the

(Continued on page 112)

Torque Converters on Drilling Rigs . . .

ONE of the most important developments in power transmission in many years has been the application of fluid-drive units. And even as these units have been applied in automobiles and other vehicles, so have they been applied to the "power" or internal-combustion-engine-powered drilling rig.

Applications to drilling rigs are increasing as older rigs are replaced or supplemented by newer models. Drilling contractors and major-company drilling divisions alike have been extremely favorably impressed by performance of these units, both the hydraulic coupling and the torque converter. That this is so is shown by the following excerpts from questionnaires submitted to West Texas drilling personnel by the West Texas subcommittee on drilling practices of the A.P.I.

These people were asked, "Why did you choose fluid-drive unit?" They answered—

- We want the shock-absorbing characteristics of a fluid unit . . . higher over-all efficiency and ease of operation . . . rig's lower operating and maintenance expense and higher second-hand value.
- Torque converters purchased to reduce shock loading in rig . . . where shock is reduced maintenance stays at a minimum . . . full hoisting power and pump pressures are maintained much easier than with a conventional rig.
- To provide cushioned drive for ease in maintenance of clutches, engines . . . provide added flexibility and hoisting torque . . . reduce shock and produce full hoisting power and pumping pressure.

They were asked, "What have fluid drives done for you?" and they answered—

- Use of disconnecting hydraulic couplings has given much improved chain life in draw works, compound, and transmission . . . no replacement in 3½ years . . . only trouble has been occasional plugging of dump valves and very minor overhaul and maintenance expense.
- Converters pay for themselves in 6 months . . . converters add rig flexibility and torque, possibly reduce trip time 15 to 20 per cent.
- Converters have reduced shock loading throughout rig . . . converter drive on mud pumps offers extreme flexibility for volume and pressure delivered with minimum number of liner changes . . . high starting torque for acceleration of drill pipe afforded by converters by making available 80 per cent or more of input horsepower during majority of hoisting cycle without engine lugging.
- Chain line has improved amazingly . . . improvement has been noted in maintenance of all driven equipment . . . line life improved . . . nearest thing in operation to a steam rig we have seen yet.

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write TODAY for descriptive swab pamphlet

Higher thermal efficiencies with solid fuel savings, plus reduction in number of costly shutdowns, boost use of

Direct-Fired Heaters in Natural-Gasoline Plants

by Harold J. Born* and George E. Rose*

DIRECT-FIRED heaters of the radiant-convection type are being used more and more in natural-gasoline plants.

Thermal efficiencies up to 89 per cent and annual savings up to $22,000 per heater are realizable, and improved designs make possible a minimum number of shutdowns. These two factors are principally responsible for the overall economies that result.

The direct-fired heater is accepted in many different types of service within the plant, such as heating rich absorption oil, vaporizing hydrocarbons, and reboiling liquids.

Type of heater . . . In general, direct-fired heaters may be classified according to the arrangement of the tubes. The three types thus classified are:

*Born Engineering Co., Tulsa, Okla. Presented at the Petroleum Mechanical Engineering Conference, A.S.M.E., Kansas City, 1952.

1. Heaters with all of the tubes in the convection section.
2. Heaters with all of the tubes in the radiant section.
3. Heaters with the tubes arranged to provide both a radiant and convection section. This type of heater is commonly known as the radiant-and-convection type.

Fig. 1 indicates the three types of heaters thus classified. The all-convection and all-radiant-type heaters are not commonly used. The all-convection-type heater is now practically nonexistent, due to excessive heat-transfer rates and resultant, frequent tube replacements. The all-radiant type heater has certain mechanical disadvantages along with a low thermal efficiency.

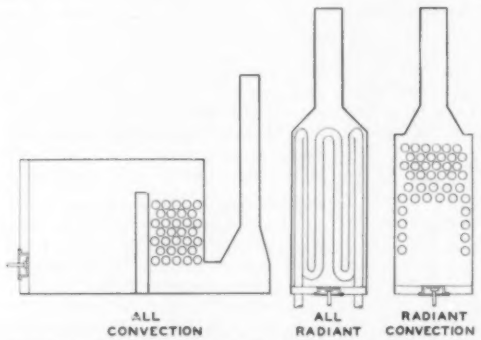
Radiant-Convection Type Heater

In the radiant-convection-type heater a distribution of tube surface between radiant and convection sections is effected to insure a good distribution of radiant heat while at the same time increasing the thermal efficiency of this heater 15 to 30 per cent above the maximum that can be expected from the all-radiant type.

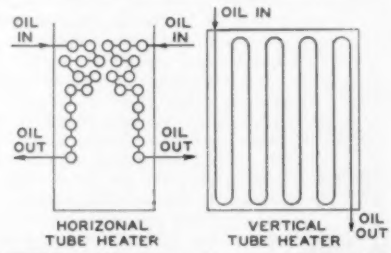
The annual fuel bills of two 30-million-B.t.u. per hour heaters, one an all-radiant type with an efficiency of 55 per cent, and the other, a radiant-convection type with an efficiency of 80 per cent, are $71,500 and $49,500, respectively.

To avoid costly shutdowns, and to insure the most efficient, economic, and safe operation possible, specifications for fired heaters should be built primarily around the following goals:

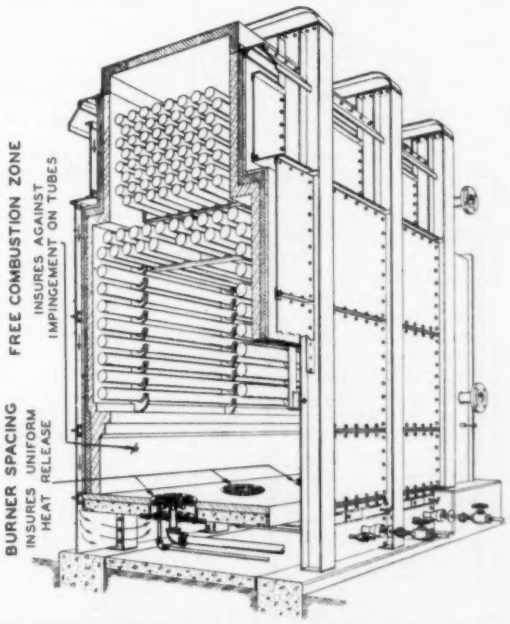
1. The heater should be designed with heat absorption rates sufficiently moderate to insure that no overheating, high skin temperatures, and subsequent cracking of the stock occur.
2. The necessity for shutdown due to maintenance should be eliminated or at least minimized.



DIRECT-FIRED HEATERS which may be used in natural-gasoline plants. The radiation-convection type is most practical. Fig. 1.



TWO TYPES of tube arrangements are possible for natural-gasoline-plant heaters. Fig. 3.



COUNTERCURRENT FLOW of oil through this heater provides for gradual heating of the oil. Fig. 2.

3. Thermal efficiencies should be as high as is economically practical.

4. The capability for good control should be inherent in the design of the heater, thus eliminating the necessity for frequent attention or adjustments.

5. Last, but certainly not least, the heater should be as safe to operate as it can possibly be designed.

Heat-Evaporation Rates

Over the years it has become the custom to establish certain rates of radiant heat transfer per square foot of tube surface as the maximum permissible for the particular service at hand. The specification of this maximum heat-transfer rate has a twofold function. (1) It is a method of sizing the heater, since in general, two heaters with the same over-all average rate of radiant heat transfer will have approximately the same amount of radiant surface. (2) The specification of radiant heat transfer rate is an attempt to limit the temperatures which will exist in the oil film directly inside the metal tube to those which will not promote incipient cracking and coking of the stock.

Since radiant heat-transfer rates are normally specified as "average" there can well be hot spots in the coil which far exceed this average and, therefore, high skin temperatures and coking can be developed in spite of the rate specified. Among the different designs of heaters being offered it is possible in some types to have high rates while yet maintaining the same skin temperatures that would occur in another design of heater at a lower transfer rate. While radiant rates are generally considered the most critical and therefore, limiting, in many cases the convective heat-transfer rate is in excess of the radiant-transfer rate.

Hot spots in the coil of a furnace are usually caused by one of several things, and these are:

1. Some type of deposition inside the tube.

2. An impingement by the burner flame on the outside of the tube.

3. Incorrect distribution of tube surface with respect to furnace layout.

If a tube is clean on the inside, the elimination of hot spots then becomes a matter of location of burners so that flame impingement is avoided and the proper physical design of the heater to insure good heat distribution throughout the furnace.

In Fig. 2, one method of accomplishing this is shown. In this design of furnace all of the tubes are kept up and away from the combustion zone of the heater so that impingement by the burner flames becomes a physical impossibility. Also, due to the use of a relatively large number of small burners, a flow flame pattern and uniform heat release are assured. Heat absorption is, therefore, also uniform throughout the length of all tubes.

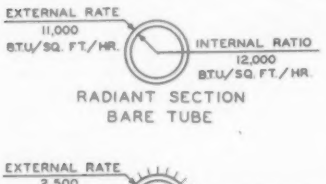
Oil flow . . . In Fig. 3, the countercurrent flow of oil through a horizontal-type heater is contrasted with the flow of oil through the coil of a vertical-type heater. It will be noted that in both cases the oil inlet to the furnace is at the top where presumably more moderate rates of heat transfer will occur than down in the bottom of the furnace closest to the burners. In the case of the horizontal tube heater, the oil is being heated as it progresses down towards the source of the heat. The oil is not subjected to the maximum rate of heat transfer until it has reached its least viscous state.

Contrast that with the flow in the vertical-tube heater in which the oil is subjected to the highest rate of heat input after it has progressed down through one tube only, and while it is still in a relatively cold and viscous state. It is obvious that with equal rates at this point in both the horizontal and vertical-tube heaters, higher skin temperatures will be developed in the vertical tube. Therefore, a higher rate of heat input is possible in the horizontal-tube heater while yet maintaining the same oil-film temperature.

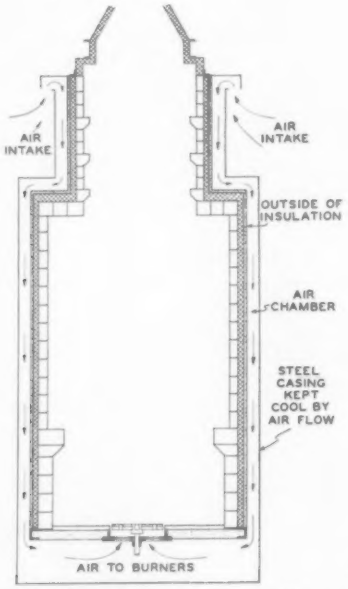
Critical rates . . . No discussion of critical heat-transfer rates would be complete without developing a fact about them that is not readily apparent at first glance. And that is that in many cases where fin-tube convection sections are used, the actual internal rate of heat transfer to the oil may be much greater in the convection section than it is in the radiant section.

Fig. 4 represents cross-sections of two tubes used in the same heater. The heat-transfer rate shown is fairly typical for gasoline-plant services, and in fact, is taken from an actual heater observed in operation. It will be noted that the radiant-transfer rate based on the outside tube surface is 11,000 B.t.u. per square foot per hour, while the inside rate based on the difference between outside and inside circumference of the tube is 12,100 B.t.u. per square foot per hour.

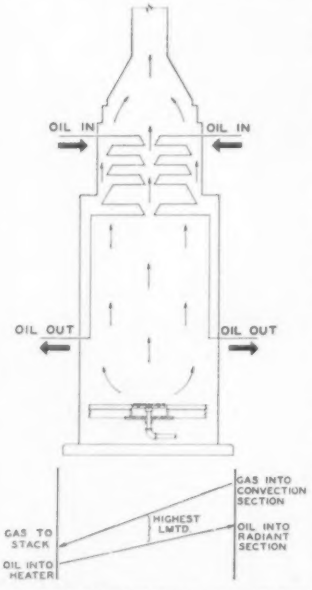
It will also be noted that the con-



TYPICAL HEAT-TRANSFER rates for natural-gasoline-plant heaters are shown here. Fig. 4.



PLENUM CHAMBER of heater provides way of preheating air. Fig. 5.



COUNTERCURRENT OIL FLOW through heater provides closest control of oil outlet temperature. Fig. 6.

vection-section transfer rate is indicated as 2,500 B.t.u. per square foot per hour. As previously pointed out, at first glance the radiant-transfer rate would seem to be most critical, since it is apparently far in excess of the convective-transfer rate; however, upon a more thorough examination, it is found that the 2,500-B.t.u. convective rate is based on the extended or finned surface of the tube.

The ratio of extended surface to actual internal surface of the tube is in the order of 12 to 1, and, therefore, the actual rate of heat input to the oil is 30,000 B.t.u. per square foot per hour. It is readily apparent that in such a case the radiant-heat-transfer rate is not the critical rate involved at all, but rather that much higher transfer rates actually exist in the finned-tube area. This explains why many finned-tube heaters coke up in the finned portion of the heater coil.

In order to prevent these high rates from occurring in their furnaces, many operators are now specifying a maximum internal heat-transfer rate of 15,000 B.t.u. per square foot per hour anywhere in the coil, both radiant and convection section included.

Refractory design . . . It has become the custom in recent years to cheapen the refractory construction in some heaters, thus effecting savings in first cost, but thereby greatly increasing the possibility of refractory failure at some future date. The possibility of wall failures is almost completely eliminated by using a type of furnace enclosure called a sectionally supported wall.

This construction is superior since the actual refractory portion of the wall consists of high-heat-duty, or super-duty, fire-brick shaped to A. S. T. M. Specification C-64. This insures that the refractory will successfully withstand high temperatures and resist thermal spalling. In the sectionally supported wall each brick shape is individually supported on a heat-resisting alloy hanger. These hangers in turn are supported by steel or iron members which carry the wall loading to the main structural columns of the heater.

Because of the method of suspension all expansion and contraction of the brick is provided for, thus no failure can occur due either to mechanical spalling or to deformation under load. Tongues and grooves at all joints between the brick shales insure against leakage or infiltration over the life of the heater.

While it is readily possible to enclose the heater with cheaper construction, the sectionally supported wall represents the ultimate insofar as prevention of all maintenance is concerned. Cheaper methods of enclosing a heater fire box are those which employ the use of either insulating fire brick or monolithic cast panel construction.

Coil supports . . . Another mechanical specification which is contributory to long tube life is that which deals with the type of casting which supports the tubes or coils within the heater. Good practice indicates that in the high-temperature zone these castings should be specified as 25 per cent chrome—12 per cent nickel alloy steel castings, conforming to A.S.T.M. B-190 Type I or II. However, to insure against early tube sagging and premature failure it is necessary that these castings be closely spaced, and also designed to insure adequate tube support, together with provisions to withstand expansion and contraction of the tube.

Provision for expansion and contraction of the tubes is made by the use of a friction coefficient. One of the major oil companies specifies a friction factor of .15, applied to the design of a tube support casting. The designer would thus assume a horizontal force of 15 per cent of the vertical loading of the tubes to be applied at the point of tube suspension. The writer's company uses a friction factor considerably higher than this. In the radiant section, it is believed that center-to-center spacing on tube-support castings should not exceed 8 ft. and preferably be 6 ft. 6 in. and in the convection section should not exceed more than 11 ft. While it is obvious that here again greater spacing of tube-support castings unquestionably results in initial economies, experience indicates that the given spacings are optimum to prevent tube sagging.

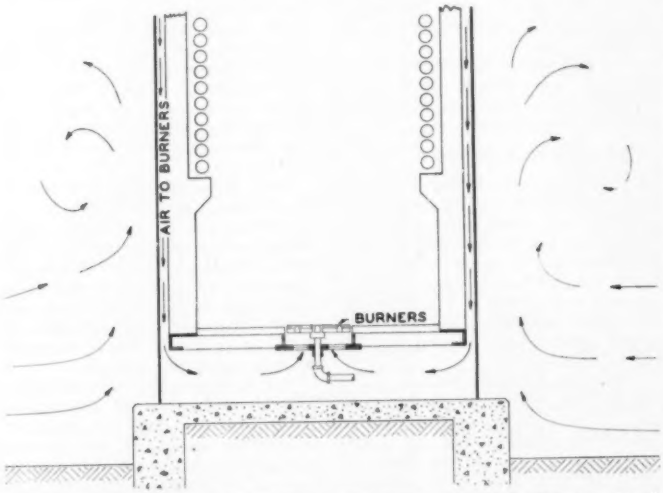
At the present time, the specification for type of headers utilized in the coil of gasoline-plant heaters is undergoing a very marked change. Until very recently it was considered essential that access for inspection and cleanout be provided to every tube in the heater. This was accomplished by the specification of rolled-type headers on at least one end of each heater tube so that a cleanout plug was available at each tube. The change that is occurring is that many operators are now accepting all-welded coil construction. That is, construction in which either cast or forged welded return bends are used at both ends of the tubes. The reasons for this are threefold:

1. Welded return bends are much cheaper in preliminary cost than are the rolled-type headers.

2. The development of methods of steam-air decoking has somewhat minimized the necessity for cleanout openings in the coil.

3. New methods of obtaining wall thickness such as by use of an Audigage are coming into use.

However, there are still many important reasons for the specification of rolled headers with cleanout plugs on at least one end of the coil. In most gasoline plants, the only method available for detecting the possibility of tube failure is an occasional calipering of the tubes to determine wall thickness and without some method for access to the inside of the coil, this cannot successfully be done. The all-welded coil thus results in an "on stream or on fire" sort of operation since the first indication of tube failure is the actual rupture of the tube.



BURNER IS SHIELDED so wind interference with burner operation is eliminated. **Fig. 7.**

Tube specification . . . In general, the

temperature ranges which exist in almost all gasoline-plant services indicate satisfactory life for carbon-steel tubes so that alloy materials are only required where some form of corrosive material is either present or expected to be present. In most cases, carbon-steel tubes are specified for the initial installation and then if corrosion is encountered the proper alloy material is then substituted, depending upon the severity and frequency of occurrence.

The normal specification for carbon steel tubes should be hot finished seamless made to A.S.T.M. A-161.

All tube supports for the heater structure should be suspended from the steel structure with no bearing on any refractory walls. The steel structure itself should, as a minimum, be designed to American Institute of Steel Construction specifications and where there are special requirements for high wind loadings or if the heater is to be erected in earthquake areas these conditions should be so specified.

Thermal efficiency . . . The largest item of expense, exclusive of labor, in the average gasoline plant is the fuel bill. Since this is the case, large economies in operation can be effected by the specification of high-thermal-efficiency heaters. As previously pointed out, the radiant-convection-type heater can be designed for very high thermal efficiencies. Heaters for processing oil at temperatures usually encountered in gasoline-plant services operate with net thermal efficiencies as high as 86 to 89 per cent. Probably the best method of specifying efficiency is to set up a minimum, say of 75 per cent, and request alternate quotations for higher efficiencies. In this way, each higher efficiency can be evaluated in terms of incremental payout and the proper selection can then be made.

In Fig. 5 is illustrated a method of air preheating by means of a plenum chamber which is utilized to not only provide additional fuel savings, but also to serve to isolate the heater. In this design, all of the secondary air for combustion is drawn in at the top of the heater and drawn down across the side walls and enters the combustion chamber as preheated air. The so-called plenum, or air chamber, is formed by the sectionally supported wall on the inside or furnace side and the steel casing on the outside. From 140° to 160° F. of air preheat is accomplished by heat that would otherwise be lost to the atmosphere. At the same time, positive air cooling of the walls is provided.

Control . . . The fourth goal to achieve in selection of equipment is good control. The capability for good control should be inherent in the design of the heater. This means that very close control of oil outlet temperature should be possible, that frequent adjustment or attention on the part of the operator to accomplish this be unnecessary, and that whatever adjustments are required can be easily made.

The closest control of oil outlet temperature is made possible by a countercurrent flow of oil through the heater. This means that the oil stream should enter the heater where the gases are coldest and leave the heater where the gases are hottest, thus insuring a continuously increasing gradient of heat absorption from the inlet to the outlet of the heater. Fig. 6 indicates this type of countercurrent flow.

Not only does this type of flow assure the highest possible thermal efficiency for a given amount of surface, but since the maximum heat input is near the coil outlet it also guarantees maximum control of oil outlet temperature. With this type of flow, it is possible to maintain temperatures within ½° F., as is confirmed by many actual recorder charts of units in operation.

To maintain good control and do so without the need for frequent burner adjustment, it is necessary to completely shield the burner from interference by atmospheric conditions. If burners are exposed to the atmosphere, wind can cause tilting of the flame pattern, unequal heating of coils, and most certainly, loss of control. One method of preventing wind interference with burner operation is indicated in Fig. 7. Here, with the use of the plenum chamber, it makes no difference whether the wind is blowing 5 m.p.h., or 90 m.p.h., flame patterns remain unaffected, since the burners are completely enclosed within the structure.

Air and damper controls should be provided on all heaters and it should be possible to make all adjustments from the ground level.

Safety of Operation

A ruptured tube within the heater and the possibility of ignition of an explosive gas cloud surrounding the unit by the fire in the heater are hazards which can be minimized to a great extent by good heater design. If a tube ruptures it is necessary to contain the fire within the heater and extinguish it and simultaneously be able to drain the coil immediately.

On a horizontal-tube furnace it is a simple matter to completely drain the coil by properly locating a dropout line at the outlet of the coil. Steam snuff lines should be specified, and these can be equipped with automatic controls if desired. Two popular methods for automatic shutdown and steam snuffing are used. In one method, a high-temperature thermocouple can be set in the stack, which by instrumentation will admit steam to extinguish the fire in the furnace when the stack temperature rises above a predetermined point. In the other method, a pressure-differential mechanism can be installed between the inlet and outlet connections to the heater, which again by instrumentation admits steam to extinguish the fire in the heater whenever the normal pressure drop relationship between these two points rapidly decreases, which condition would exist in the event of a ruptured tube.

The amount of shutdown instrumentation between various plants varies greatly and that normally such instrumentation is not specified to be supplied with the heater, but is added by the user at his discretion.

Unquestionably, the presence of a flame in an area where there is a possibility that explosive gases will exist is potentially hazardous. The most obvious method for minimizing this danger is to isolate the heater by providing space between it and any other equipment which can accidentally release explosive gas mixtures and this is done in all possible cases. An additional precaution that can be taken and which is a standard feature of some heaters is illustrated in Fig. 7. Here all air for combustion is drawn in at the top of the heater which, depending upon the size of the unit, may be 15 ft. or higher from the ground level.

Comparisons . . . There are three general methods by which various heater offerings are usually compared. The first and simplest method is to compare nothing but first cost. It seems readily apparent that by this method of comparison only the very cheapest type of equipment will be selected and that therefore, frequent shutdowns, heavy maintenance, and highest fuel cost will be assured. Fortunately, not very many heaters are selected by this method.

The second method of evaluating heater bids is one in which first cost again plays an important part, but in which heating surface and efficiency being offered are also taken into consideration. The purchaser here is attempting to make sure that he is comparing heaters of equivalent size and he is aware that increased thermal efficiency means fuel savings.

The third and recommended method of heater bid evaluation requires that not only the first cost, surface, and efficiency be considered, but that true mechanical features of the various heaters also be compared, tabulated, and evaluated.

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Size of "DU" Rotary Slips	"DU" Regular (12" Long)	"DU" Long (16" Long)
4½" O.D. Slips with 4½" Liners	135 lbs.	158 lbs.
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7" O.D. Slips with 7" Liners	152 lbs.	196 lbs.

Compare Low Maintenance!

"DU" Slip Liners are in 4" segments—not long units. **Three** 4" segments fit a 12" slip . . . **four** fit a 16" Slip. Cuts inventory costs!

Also, should table misalignment concentrate slip wear at one point, liner segments can easily be switched around to distribute wear without replacing any parts.

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In "DU" Slips all body portions are unitized together by a unique "floating" hinge that maintains rigid **vertical** alignment—yet permits free **lateral** adjustment to compensate for wear or misalignment in bore of master bushing. All body segments set together and take the same uniform grip at all times, even though pipe is off-center or crew is inexperienced. Safeguards pipe, cuts round trip time!

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With "DU" Slips you don't need a separate slip for each size of drill pipe. By simply changing the liners—a quick inexpensive operation—only 3 basic "DU" body sizes fit 14 different pipe sizes . . . in fact, all sizes of tubing, drill pipe and casing from 2⅜" through 7" O.D. Saves money on slip investment!

Baash-Ross "DU" Long Rotary Slips

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"DU" Slips are designed so that *all* stresses—both of supporting the pipe string and of breaking joints—are transmitted directly to the slip body. No bolts or pins to become sheared and allow liners to fall into hole. Yet, liners can be quickly removed by sliding out a double keystone retaining key that firmly mates liners and body into a single rigid unit!

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See our Exhibit at the Tulsa Oil Show!

The specially constructed chart guide and tape bar, top of adding machine, facilitates handling of charts under the new system. View at right shows operator printing integrator difference directly on chart.

Here's a new time-saving method of

Calculating Orifice-Meter Charts

Not only does this system reduce by half the time required for the operation, but also practically eliminates the human element of error in computing.

by Carl Hoot
District Editor

A MODERN adding machine, in conjunction with one of the most intricate of calculating devices used in the gas industry, has resulted in time savings up to 50 per cent in calculation of orifice-meter charts. This simplified system may eliminate the human element of error in this phase of gas measurement.

Calculation procedures which follow the reading of charts on the Rockwell integrator are as various as the companies using these chart-reading machines. Most recent procedures by major companies employ the use of tabulating devices and electronic computers to convert the integrator stop-reading and start-reading to the final delivery. However, the procedures presented herein will materially speed such procedures by elimining electronic calculations and reducing all calculations to a series of straight multiplications; speeding the work of the integrator operator; and reducing to a minimum any undetectable errors by operators.

Data for this article were obtained from John P. Squier Co., Dallas.

Transpositions and misreading of integrator counter . . . One of the most common errors in chart integration is the use of a transposed or erroneous reading on two consecutive charts in sequence, which produces an error on both charts but does not prevent a balance of readings in charts as a group. Most operators try to eliminate this cause of error by instructing the chart reader to refer to the integrator counter reading when the chart is finished, and again when the reading is placed on the subsequent chart.

However, it is perfectly normal for an integrator operator, especially during rush periods, to place the stop-reading on the finished chart and without further reference to the counter, place the same reading as the start-reading on the next chart. This procedure is satisfactory so long as the initial observed reading is correct but if, for example, the correct integrator stop-reading is 2745 and the chart reader uses 2475 and carries this forward to the next chart as 2475, the entire group of charts may be in balance in regard to consecutive readings, but two charts in the group will be 10 per cent in error.

The misreading of the integrator counter many times produces such large errors that detection is made by visual comparison of final volumes, but this is not detected until all of the calculating work is done and usually necessitates reintegration of the charts in question and lost time in correcting the delivery statements.

Error eliminated . . . Elimination of this error by using the adding machine is accomplished by an alteration of the tape bar on the machine to cause the stop-reading to disappear from the operator's view. Since there is the operation of printing the total difference of the readings on the chart before using the stop-reading again, this number has not been retained by the operator and consequently the most effortless method to obtain it is from observation of the counter-reading on the integrator, and not from turning the adding machine tape.

```
        *
        *
3,475 -
4,295
4,295 -
7,066
7,066 -
10,651
   651 -
 3,943
 3,943 -
 7,000
 3,057 *
 7,000 -
10,620
   620 -
 3,850
 3,850 -
 6,200
 6,200 -
 6,321
   121 *
 6,321 -
 9,200
 9,200 -
10,062
    62 -
 3,785
```

Fig. 1—A rerun in a group of charts is indicated by the "total" insigne (*), which is taken into consideration when the group of charts is balanced in the regular manner. Counter turnovers are indicated by the number of 1's in the first column.

Fig. 2—Difference reading (2344) is printed on reverse side of chart with adding machine.

The adding machine may easily be altered so the tape can be turned only forward, which would create a detectable space on the tape should the chart reader use this as a source of obtaining the reading.

Expediting integration of charts . . . The system, although primarily installed to reduce calculation time and counter-reading errors, has proved to speed the integrator operator's work considerably. When a chart is traced, and for any reason a retracing is necessary, the total is simply printed on the tape and the chart rerun without removing from the machine.

Fig. 1 indicates a rerun in a group of charts, indicated by the "total" insignia and this total is taken into consideration when the group of charts is balanced in the regular manner. Some operators require the chart reader to keep a record of the number of counter turnovers, or repeats, in each group of integrated charts. However, that is no longer necessary with this system. The integrator operator merely adds the digit 1 to the stop-reading each time the stop-reading is smaller than the start-reading.

The series of counter readings shown in Fig. 1 indicates how clearly the number of counter turnovers may be observed—by adding all of the "1's" in the fifth column of the tape. This feature, besides saving time, eliminates the possibility of errors in counting the number of times the counter has started over.

If an integrator operator prints the wrong reading on the tape and detects the error, the erroneous reading is simply cancelled by using the opposite print key on which the original error was made.

Calculation time reduced . . . Fig. 1 illustrates the tape record of a group of charts from which the calculator operator makes a balance of a group of charts. If a combined machine-constant and hourly meter coefficient is used, the charts are balanced through the difference.

If the extension is desired, the printed difference on the charts are multiplied by the integrator-constant before a balance is made. As an example of a balance through the difference, the calculator operator, or tabulating department, makes addition of all of the printed differences on the charts which is noted on the tape, and which in this example is 27132. The counter repeats are then counted as the digit "1" in the fifth column of the tape and found to be three. Then the final integrator reading for the group is 3, plus the last reading shown on the tape, 3785 or 33785. From this is subtracted the initial reading of the group, 3475, also reruns of 3057 and 121. This figure will balance to the total differences as added from the charts if no errors have been made.

Variations in procedure . . . The system can be altered to various operators' needs and advantages. Further time may be saved by using an adding machine equipped to render a total of all of the differences whereby the adding of the differences from the charts can be eliminated. From this total any rerun differences should be subtracted before making the balance as described in the preceding paragraph.

For a number of years, considerable study has been given to the idea of a counter adaptable to the integrator whereby the difference would be printed on the chart. However, to make such an attachment foolproof, a continuous counter such as that with which the machines are now equipped, would still be necessary for positive check of a group of charts.

It is believed the integrator-adding machine system described herein closely approaches this idea without alteration of the integrator, and companies who use integrators can install such a system with an investment of $300 or less per machine.

Hole for Sale . . .

AT LOW COST

Drilling contractors everywhere are finding that the hole they drill costs less when it is drilled with **REED** Twin-Blast Rock Bits.

Slush from Twin-Blast nozzles blasts cuttings up into the return mud stream before they can be recycled. Cutters are always working on new formation, instead of grinding up pieces that have already broken loose.

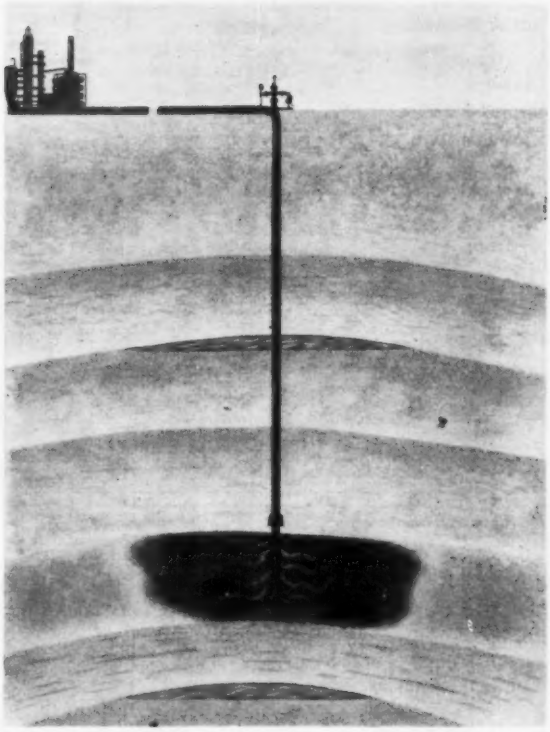
The result is faster drilling, more footage per bit and lower cost per foot of hole.

REED
TWIN-BLAST
ROCK BITS

REED ROLLER BIT COMPANY
Houston 1, Texas

3021

CHRISTMAS TREE arrangement which permits either injection or recovery of L.P.G. from underground storage reservoir.



SCHEMATIC DIAGRAM showing position of water-filled sandstone storage reservoir lying between gas zones.

California Standard Successfully Stores L.P.G. in Water-Filled Sandstone . . .

Product recovered without contamination

by Joseph A. Kornfeld
District Editor

STANDARD OIL CO. of California has stored successfully large quantities of L.P.G. in an underground water-filled sandstone reservoir lying at a depth of 3,400 ft. This storage site is situated conveniently only 3 miles from the company's El Segundo, Calif., refinery southeast of Los Angeles.

Standard has injected 2,520,000 gal. of propane since the experimental project was initiated during 1952. Total propane recovered to date has been 630,000 gal. and there has been no contamination of product, as shown by refinery analysis of recovered products.

Standard geologists reviewed their subsurface geologic structure maps of folds lying in the vicinity of the El Segundo refinery. One particular structure contains gas sands lying at depths of 1,500 ft., 3,800 ft., and other levels. However, these gas zones were not utilized for injection and a thick, water-filled sandstone lying at a depth of 3,400 ft. was found suitable for conversion to L.P.G. storage.

Drilling . . . A portable rotary rig was moved in on the crest of the structure at a drill site selected by the geologists. Conductor was driven to a depth of 49 ft. and two joints of 18⅝-in. conductor pipe set and cemented to the surface.

A 15-in. hole was cut to a depth of 552 ft. and a string of 11¾-in. pipe set and cemented. Finally, a 12-in. hole was cut to a depth of 3,413 ft., total depth.

Completion . . . The production string of 7-in. pipe was run to a depth of 3,358 ft. and cemented. Then a 5½-in. liner, 169 ft. in length, was hung to 3,413 ft.

A gun perforator was run on a wire line and the liner perforated opposite the water sand. The 12-in. bore hole around the liner was gravel-packed from 3,346-3,411 ft. using 52 cu. ft. of gravel. A string of 2-in. tubing was run for final completion.

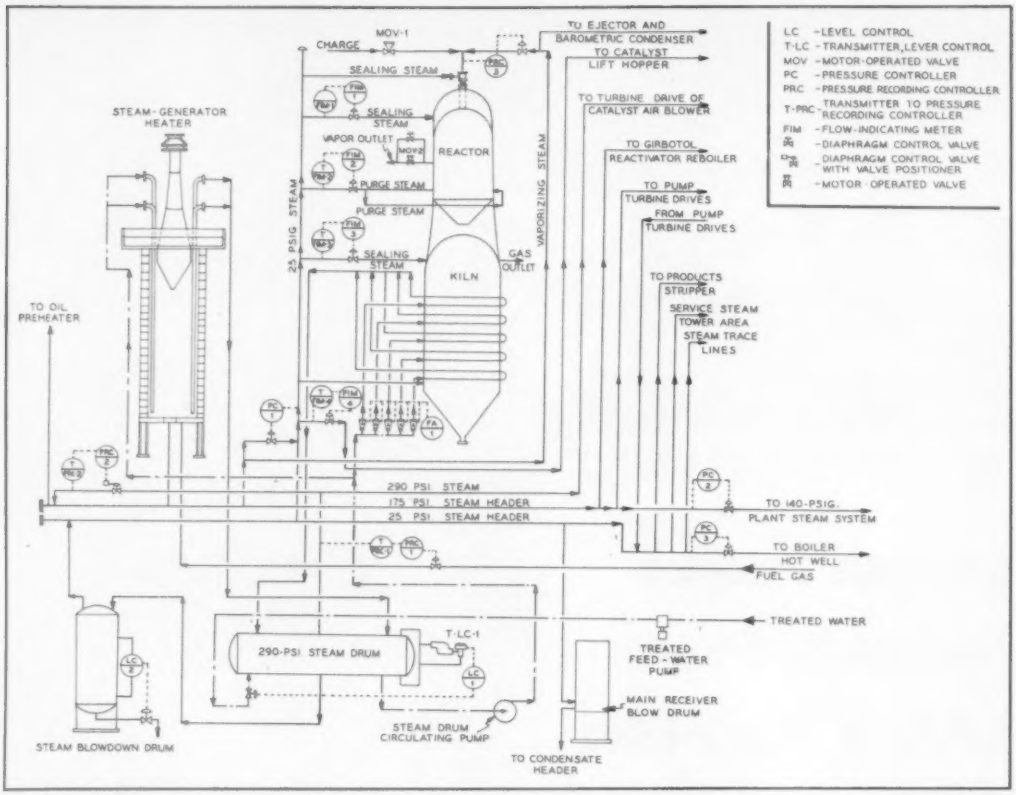
This arrangement afforded ready access to the water-filled sandstone formation both for injection and recovery of propane.

Injection and Withdrawals

Normal hydrostatic head for this reservoir is 1,479 psig. However, using the above arrangement, propane has been injected under pressures of only 700 psig. through the tubing and 710 psig. on the casing at injection volumes up to 63,000 gal. per day.

Withdrawal rates of 42,000 gal. per day have been made satisfactorily under pressures of 610 psig. on the tubing and 690 psig. on the casing.

The conventional christmas tree arrangement used for both injection and withdrawals is shown in an accompanying photograph.



LOW-COST instrumentized steam-generator system, such as above, has proved itself in the several years it has been in operation. Fig. 1.

REFINERY POINTER

How Tide Water Associated Instruments Waste-Heat Steam-Generator System

by L. L. Benthall*

IN setting up the steam-generator control system at the Tide Water Associated Oil Co. refinery at Drumright, Okla., it was decided to employ fairly "conventional" instrumentation. A low-cost system was designed which has given over-all satisfactory performance in the several years during which it has been in operation.

Steam consumption . . . The waste-heat steam generating system at Drumright produces sufficient steam to drive all turbines and to furnish low-pressure steam to the catalytic cracking and other process units. The existing plant steam system, at the time the new facilities were installed, furnished steam at 140 psi. Since the turbine which drives the cat cracker air blower requires 290-psi. steam, the new facilities were designed for this pressure with provision made for stepdown in steam pressures to 175 and 25 psi.

Most pumps at the Drumright refinery are either steam-turbine driven or direct-acting steam pumps and constitute by far the largest demand for 175-psi. steam. The 175-psi. system was designed to tie in with the existing 140-psi. plant system. Largest demand for 25-psi. steam is as seal and purge steam for the cat cracker. The steam balance is given in Table 1.

TABLE 1—STEAM BALANCE

	lb./hr.
290-psi. steam production	
From steam generator	21,729
From kiln coil	8,350
Total	30,079
Steam consumption	
290-psi. to blower	7,760
175-psi. to pumps	19,787
175-psi. to barometric	338
175-psi. to process	1,476
175-psi. to cat cracker reactor	1,000
Total 175-psi. steam	22,601
25-psi. steam to process	948
25-psi. steam to seal and purge	12,600
Total 25-psi. steam	13,548

*Head of instrument department, Drumright, Okla., refinery, Tide Water Associated Oil Co.

Steam generation . . . Fig. 1 shows how a Petrochem vertical upflow heater is used as a steam generator in conjunction with heat recovery through the kiln (regenerator) cooling coils of the Houdriflow cat cracker.

Feed water from the treating plant is discharged by the feed-water pump at 350 psi. to the steam drum from which steam is obtained at 290 psi. and 414° F. The steam-drum circulating pump, which has an electric-motor-driven spare, takes preheated water from the steam drum and pumps it through the kiln-cooling coils. These function to regulate temperature of regenerator catalyst bed and also recover heat for steam generation. The coil section consists of about 100 tubes arranged in 5 sections around the kiln. Hot water is flashed back from the kiln-cooling coil section to the steam drum.

The steam-drum circulating pump also feeds the steam-generator heater. Split flow is utilized on both the water inlet and steam outlet of the heater.

A utilities balance is achieved in which the catalytic cracking unit produces enough fuel gas to operate both the upflow heater and a similarly constructed but smaller vertical heater used as an oil preheater. In turn the steam generator produces enough steam to serve the catalytic cracking unit and other process needs.

Instrumentation

Level on the steam drum is controlled by LC-1, a level controller which operates on a 35-in. water column to regulate a control valve in the feed water inlet line to the drum. As the level falls in the drum the level controller acts to open the control valve, admitting more water to the drum. The steam drum is also equipped with a level alarm and level indicator.

Control of heater . . . The heater is intended to act as a sort of balance wheel in the system. Water flow, on the inlet side of the heater, is controlled manually while outlet steam flow is wide open. Flow of fuel gas to the heater is controlled by a pressure-recording controller, PRC-1, operated through a locally mounted transmitter on the pressure in the 290-psi. steam line. A manual-control set panel and pressure recorder are provided on the board. A full pressure-balanced control valve is used on the gas line to the heater so that better pressure control may be achieved.

Kiln coil protection . . . Coil sections are provided on the inlet side with slug check valves (pressure-drop safety shut-off valves) and also with a flow alarm as protection in the event that a tube should blow out.

Pressure reduction . . . Since pump-drive turbines are designed to operate on 175-psi. steam, a pressure-reducing station is provided between the 290-psi. steam line and the 175-psi. header. This consists of a spring-loaded control valve with valve positioner regulated by PRC-2 which works through a locally mounted transmitter, with manual control set panel on the board. A pressure recorder is also provided.

The pressure controller, PC-2, is used to hold a back pressure on the 175-psi. system. This latter is designed to "float" on the existing 140 psi. plant steam system. It probably would be preferable to use a flow-recording controller here instead of the pressure controller in order to minimize oscillation.

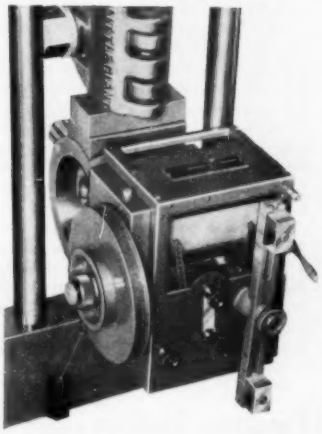
Turbines exhaust into the 25-psi. header from which steam is taken for the products stripper, for steam trace lines, and as sealing and purge steam for the cat cracker. The controller PC-3 holds a back pressure on the 25-psi. system.

Pressure controller PC-1 opens to admit steam from the 175-psi. system in the event that pressure drops below the set point in the 25-psi. line feeding steam to the cat cracker.

KNOW THE FACTS . . .

Improve Your Pumping Wells!

J-F DYNAMOMETER *tells how . . .*



. . . production is increased with operational control! The J-F Dynamometer enables checking of pumps at surface; reduces number of sucker rod failures by determining the most favorable operating speed and stroke. It reveals poor counterbalance, thus extending the life of the prime mover and gear box; aids the operator in selecting proper equipment. Decreased downtime and fewer pulling jobs mean more production at less expense.

J-F DYNAMOMETER WIDELY ACCEPTED!

The effectiveness of the J-F Dynamometer is proven by the fact that it is one of the few instruments of scientific control so widely used on pumping wells. The chief reason is that the J-F Dynamometer is simple to use and may be operated by non-technical personnel.

JOHNSON-FAGG

Engineering Company

3920 South Peoria — Tulsa, Oklahoma

Hydraulic Units in The Oil Field

(Continued from page 99)

converter proper. Therefore little or no sand can enter the converter and attack its seals as long as the filter is kept clean. Some sand can enter the reserve tank through the filter opening, but reasonable care in keeping the cap on tightly and using clean buckets when adding fluid will keep this to a minimum.

Converter Failure

Torque-converter failures—those requiring complete overhaul—fall generally into three categories as far as causes are concerned. They are:

1. Seal failure.
2. Bearing failure.
3. Foreign bodies in the fluid system.

The first cause is by far the most common of the three and usually is the primary cause of bearing failure. The seal used in the converter illustrated here consists of a lapped steel nosepiece, spring-loaded, bearing against a lapped carbon ring. The steel nosepiece is lapped to within 12 millionths of an inch of perfection. It therefore serves as a very effective seal until sand or metal particles attack it. The seal will last 2 to 3 years with normal maintanance, as a rule. They have been known to run 5 years before replacement. Average life in West Texas, without regard to the degree of care in maintenance, has been about 18 months.

Bearing failure usually stems from one of three causes. First, the seal fails, allowing torque fluid to invade the bearing. Since the torque fluid is under 50 to 60 psi. pressure it soon displaces any bearing lubricant within the bearing, and since the torque fluid has no lubricating qualities whatever the bearing is doomed to early failure.

A second cause of bearing failure is pure fatigue. Any bearing in any application will wear out some time. There have been a number of cases where this has happened after 3 or 4 years of continuous service. As a rule, however, the seal will commence leaking first and the operator has some warning.

A third cause of bearing failure is lack of lubrication. Complete bearing failures are quite rare but are very damaging, usually wrecking at least one major component of the converter. It is therefore important that when the unit is found to be leaking the seals be replaced and the unit checked very thoroughly. This job usually costs about 10 per cent of the original price of the converter. Bearing failure before seal leakage is usually preceded by a growling in the unit and is not hard to detect. Immediate steps should be taken to repair the unit. Undue delay can be costly.

It isn't often that foreign bodies large enough to inflict serious damage enter the converter. A section of 20-penny nail was found in one, however. That unit had to be scrapped since the blades were all stripped. It was never determined how the nail found its way into the converter. It couldn't pass through the auxiliary fluid pump, so it had to be dropped into the radiator or into the converter housing. There have been two cases where the converter was used to brake the pipe load going in the hole and some blades were torn loose. These, of course, destroyed the rest of the blading.

The operator can depend upon a repair and maintenance cost of 10 per cent per year of the original cost of the converter in the case of the larger units and 15 per cent on the smaller units. Above-average maintenance can lower this figure; below-average maintenance could increase it somewhat.

Hydraulic couplings of the design shown here have been in service on drilling rigs for 3½ years now and repairs have been so slight as to be negligible. Only one major overhaul has been done, that on the original set to be placed in the field. The cost was approximately 20 per cent of new cost after 3 years of service. A very good outline describing trouble shooting may be found in maintenance manuals.

The present-day hydraulic drives are probably not the final word in design. They are continually being improved—the various bugs being removed as they make themselves known. All manufacturers are striving to improve their products and are making great strides in that direction.

Trunkline Stations Models of Compactness

(Continued from page 89)

mufflers located on a direct run from an engine that receive the brunt of a blowback.

Air intake to the engine is a combination scrubber-filter unit with a brass-wool cartridge soaked in oil as cleaning medium. When pressure drop across the unit becomes unacceptable, as checked by manometer readings, these cartridges are removed and cleaned.

Station layout . . . With the exception of the Longville station, which has two incoming main lines, one from Louisiana and one from Texas gathering systems, all of the station layouts are essentially the same. A design feature has been to place all piping, including main lines, auxiliary lines, conduit and wire, aboveground either on concrete piers or on overhead stanchions. In addition, large-diameter lines are used to carry smaller lines wherever feasible within the station limits. This arrangement provides ease of inspection and accessibility.

Gas enters the station at about 600-psi. pressure and passes through dry-type gas cleaners before entering the compressors. A mainline bypass is provided just before the cleaners so that gas can pass directly into the outgoing line should conditions so warrant. Compressors boost the gas to its discharge pressure of 900 psi. at which pressure it enters the station discharge line.

Each station is equipped with automatic shutdown facilities for emergency use. In an emergency, station side gates are closed, engines shut down, and yard piping on the station side of the side gates is blown down by a series of automatic sequences activated from a remote-control station.

Main line . . . The line, which is approximately 1,300 miles in length, crosses the states of Texas, Louisiana, Mississippi, Arkansas, Tennessee, and Kentucky and terminates in Illinois. At the present time, delivery capacity of 250 million cubic feet per day is delivered, almost in its entirety, to Panhandle Eastern Pipe Line Co. at its Tuscola, Ill., compressor station.

Station superintendents at each station are as follows: F. J. Thielen, Longville; R. W. Mills, Epps; K. A. Hamilton, Independence; W. M. Waite, Joppa.

Tellepsen Construction Co., Houston, constructed the four stations.

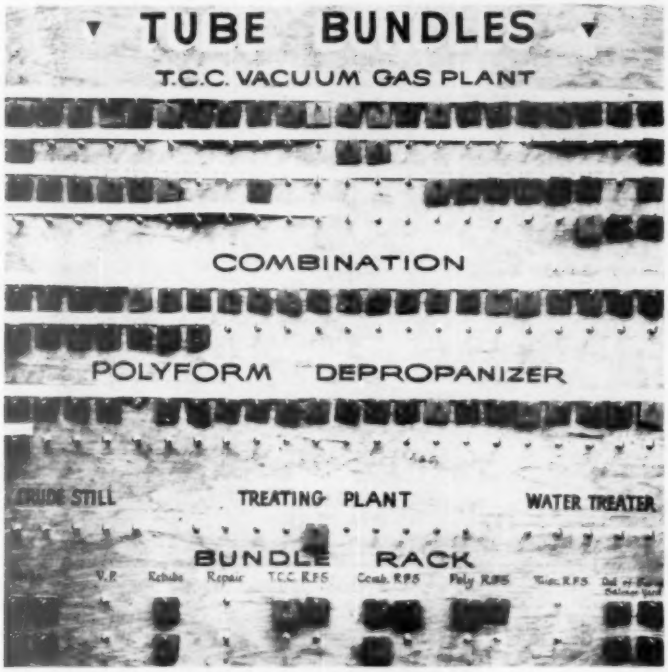
BOOKS

PROBLEMS OF CLAY AND LATERITE GENESIS. A Symposium. Published by American Institute of Mining and Metallurgical Engineers, 29 West Thirty-ninth Street, New York City. 240 pp. $6, $4.20 to A.I.M.E. members.

A composite volume for practical and research purposes, this book discusses basic problems in terms of occurrence, identification, and genesis of clays and the hydroxide minerals of aluminum and iron. In scope it ranges from prospecting techniques to interpretation of X-ray and other experimental data as related by experts in the field from here and abroad. Problems of clay-mineral identification and genesis are discussed with special attention to limitations of various instruments and techniques; differential thermal, X-ray, electron microscope, and others.

GEOLOGY OF OUACHITA PARISH. By Kia Kang Wang. Published by Department of Conservation, Louisiana Geological Survey, Baton Rouge. 126 pp.

This is Geological Bulletin No. 28 of the Geological Survey, and is the first covering that area. Ouachita Parish is located on the southern flank of the Monroe uplift. Accompanying the book is an envelope containing 12 maps, showing various stratigraphic sections, structures, etc.



BUNDLE-CONTROL BOARD showing location and condition of the various tube bundles in the refinery.

Tube-Bundle Board

It tells refiners at a glance where each tube bundle is, what condition it's in at Socony's East Chicago plant

by Gerald L. Farrar

LOCATION of any tube bundle in the refinery can be determined immediately from the tube-bundle-location board in the East Chicago refinery of Socony-Vacuum Oil Co., Inc.

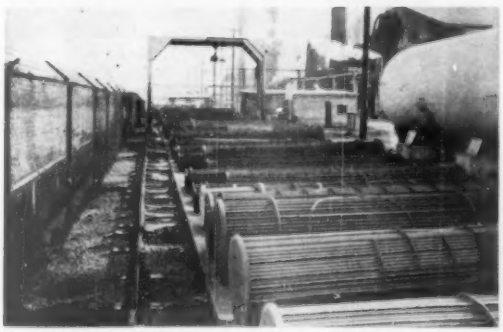
As shown in an accompanying picture, each bundle is assigned a number. This number is then stenciled onto a plastic tag. The tag is placed on the board to designate the correct location of that particular bundle.

For example, tube bundle H55 (see photo) is in service in the T.C.C. vacuum gas plant. When the bundle is removed for maintenance or repairs, the tag is removed and placed in the appropriate location under the "Bundle Rack" heading. If only cleaning is necessary, it is placed under "clean." If retubing or other repair is necessary, the tag is filed under one of these headings. Similar headings are available, or can be made available, if other handling is indicated.

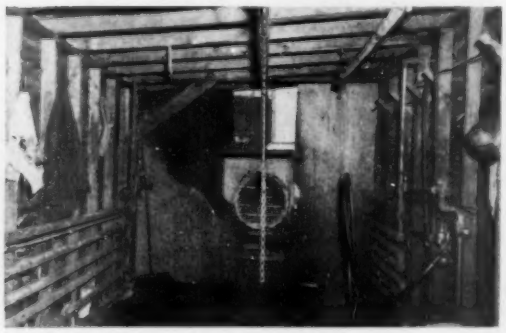
When the tube bundle is ready for service, the tag is placed under T.C.C., Combination, Polyform, or Miscellaneous "R.F.S." When it is no longer deemed feasible to repair the bundle, it is consigned to the salvage yard under the designation, "Out of Service."

Bundle storage rack . . . When the tube bundle is removed from service, it is transported to the bundle storage rack. Handling at the rack is facilitated by a gantry crane, mounted on rails for moving up and down the rack.

A shelter house is provided for protection of maintenance personnel while they are working on the bundles. As shown in an accompanying picture of the interior of the structure, the bundles are placed so that the end of the tube sheet extends into the house. Steam, air, and water are piped to the location for use in cleaning the bundles.



GENERAL VIEW of tube-bundle storage rack, gantry crane for handling bundles, and the shelter house.



INSIDE VIEW of shelter house. Bundles are set so the ends (tube sheets) extend into the house.

Handy Valve Rack

FINDING the proper replacement valve in a hurry is no problem at the Gulf Refining Co. refinery in Toledo.

A special valve rack has been made by welding pieces of channel iron together to form the frame. Additional pieces of channel iron are then welded to the frame to form slots, as shown in the accompanying photograph. The valve handle is inserted in the appropriate slot for storage; the valves are then readily accessible when needed.

Proper sized slots . . . The slots are sized properly for the particular valve to be stored in a given section of the rack. Clearance space on all sides of the slot is determined by the size of the stored valves.

Proper coding of the various storage spaces is the final requisite. As shown in the photograph, vertical sections are laid out in alphabetical order, while horizontal sections are numbered in numerical order.

Use of the system has been very successful, according to D. E. Hart, refinery superintendent.

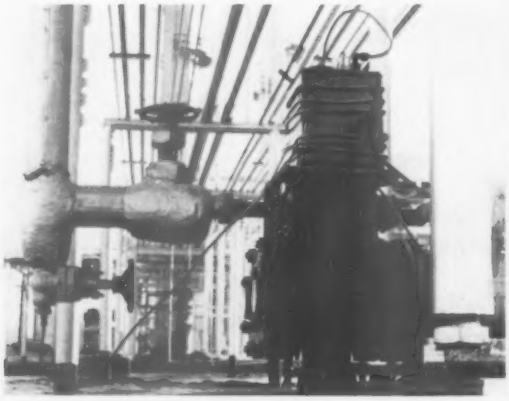
Method of Applying Wax to Floors Reduces Hazards

Use of automobile wax (Simonize) and a new process of application has been adapted for pump-room and engine-room floors by Phillips Petroleum Co.

Suggested by John E. Rowe of the supply and transportation department, the Simonize, used instead of red wax, results in reduced applications, an oil-resistant surface making it an easy task to remove the oil, and reduced hazards of slipping.

Process of the application is to first use the red wax, then apply the Simonize on a small area, wipe it off the area with a rag, and then polish it by rubbing lightly with fine steel wool.

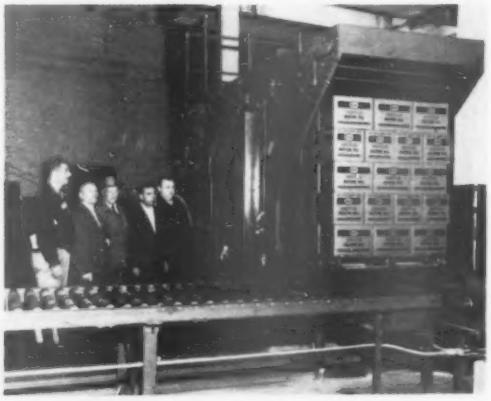
Frequency of using the Simonize is once every 6 to 8 weeks. Frequency for applying red wax is once every 10 to 12 days, plus rubbing down the floors intermittently.



Steam Heating Coil

A FEW feet of ¼-in. copper tubing, tied in to an adjoining steam-heated products line, has made housing unnecessary on outdoor transfer pumps at Cosden Petroleum Corp.'s Big Spring, Tex., refinery.

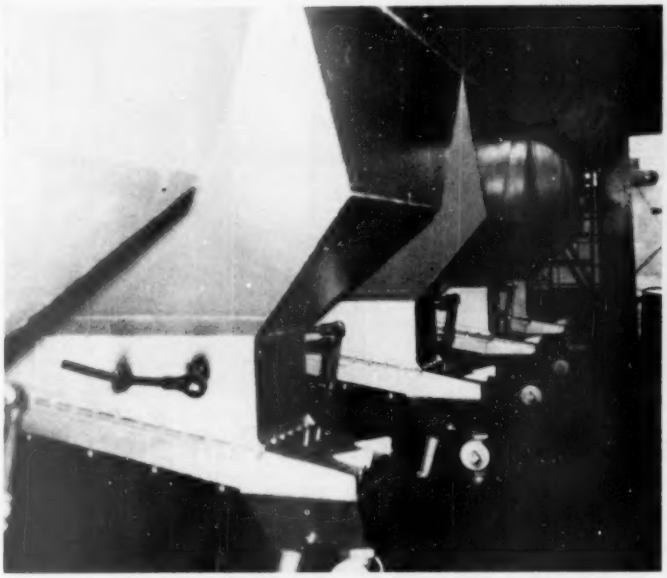
Tubing is wound around the cylinder lube-oil storage reservoir on each pump and a small quantity of steam is bled off through the valve connection on left in the photo, and vented into the air. Heat from the copper steam line maintains operating temperature in the oil tank at all times, regardless of weather.



Automatic Palletizer

ESSO STANDARD OIL CO. recently installed this Lamson palletizer in the motor-oil canning building of its Bayonne, N. J., refinery. The new unit automatically palletizes the 24/1 quart cartons of Esso's new motor oil coming off of two filling lines.

The cartons are stacked 50 to a pallet load in a predetermined pattern. The unit can handle approximately 30 pallets or 1,500 cartons per hour. The conveyors feeding the palletizer are so installed to permit filling different products on the two filling lines, with the unit making an automatic selection of the cartons of each product.



THIS FIVE-HOPPER bin with 4,400-sack capacity is part of the bulk-mud storage system used by Superior Oil Co. on the world's largest offshore drilling barge, the W. M. Keck, Sr. Mud is mixed for drilling in two tanks by special "Lightnin" electric mixers, manufactured by Mixing Equipment Co., Inc.

Storing mud in bulk . . . . . on world's biggest offshore drilling barge

HANDLING thousands of sacks of cumbersome drilling mud in bulk on a drilling barge offshore is no small task, and many problems arise in finding a place to put it within the comparatively small confines of the barge.

However, Superior Oil Co. has found the answer on its W. M. Keck, Sr., drilling barge, the world's most up-to-date and largest barge ever built for overwater drilling. By using space forward of the machinery, big integral tanks can hold a total of 4,400 sacks efficiently.

Five hoppers . . . The integral tanks have five hopper compartments *(see photograph)* plus motor-driven loading and unloading screw conveyors. Two active mud tanks are also located in the area, one 10 by 20 by 11½ ft. deep, and the other 10 by 17 by 11½ ft. deep. One slug tank is available with 3 by 10 by 11½ ft. deep dimensions.

Jet mixing guns . . . Mud tanks on the W. M. Keck, Sr., are equipped with jet mixing guns and "Lightnin" electric mixers, manufactured by Mixing Equipment Co., Inc.

The drilling barge was constructed by Levingston Shipbuilding Co., at Orange, Tex. It incorporates both the latest drilling equipment and modern crew conveniences to make it a true "driller's paradise" *(The Oil and Gas Journal, February 9, 1953, page 98).*

Wire Line Mounted to Rig Cuts Down on Moving Time

The wire line is mounted on this rig *(above)* of Great Western Drilling Co., and goes right along with it when the rig is moved from location to location.

Not only does the mounting prevent lost time in moving, but the spool is easily accessible and the line can be unreeled or reeled in without difficulty.

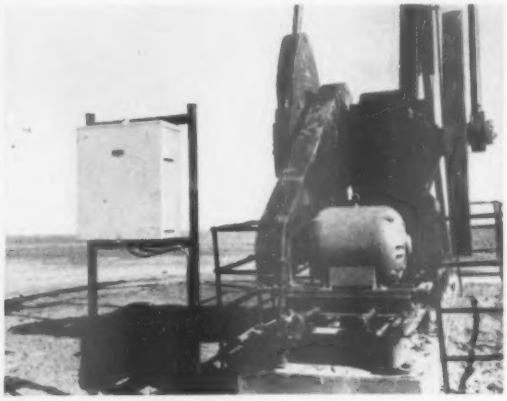
This installation is on a Great Western rig drilling in Prentice field, Yoakum County, Texas.

Shock Absorber!

That old tire laying on the ground is there for a purpose: As a "shock absorber!" The tire is placed below the electrical-switch box as an insulator for production man while starting and stopping pumping unit. This photo was taken on an independent operator's lease near Lubbock, Tex. Note how easily cattleguard fence can be dismantled and moved (circles). Pipe slips into ready-made "sockets," but is adequately sturdy.

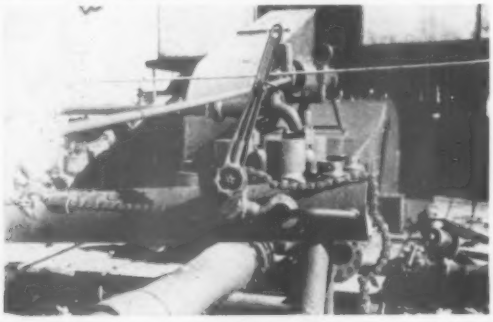
Midget Pipe-Line Pump

PUMPS rightly should be of a size to do the job, and should not be too large or too small for the general service requirements of a particular setup. Many not directly connected with pipe-line operations visualize pumps in this division of the industry only in the very large sizes. This one is on the other end of the range classification. It is a 1.2-hp. single-cylinder, 4-cycle gas-engine-driven rotary pump. The unit is in pipe-line gathering use by Service Pipe Line Co. in Prentice field of Yoakum County, Texas.



Electrified Pumping

ELECTRIFIED pumping of oil wells is a well-known practice, and one which is considered to be efficient, economical, and free of trouble. There is nothing particularly unusual about the equipment shown in the above photograph, but it does show the newly installed electrical components (motor starter and motor) of a Pennsylvanian Canyon reef producer in Scurry County, West Texas. This well is Humble Oil & Refining Co.'s Walker Huddleston B-2, in Diamond M field. Electricity is used widely for pumping in this region.



Here's an idea for "holdups" on suction pipes

ROWAN DRILLING CO. has equipped its Rig 17 with a safe and positive holdup for suction pipes of the twin mud pumps.

The structure is a long "saw-horse" type affair built out of pipe for the horizontal member and supporting legs. The base is made of two pieces of channel iron which may be set directly on the ground or supported by cribbing when the surface is wet or muddy.

Each of the pipes extending into the suction pit is equipped with a substantial bail over which the supporting structure is located.

"Comealong" used . . . Attached to the supporting structure, and becoming an integral part of the apparatus, are two ratchet devices, commonly referred to as "comealongs." Wire lines attached to the chains of these operating devices pass over small sheaves supported with brackets welded over a slot in the horizontal supporting member of the saw-horse, and with the opposite ends attached to the bails on the suction pipes.

The comealongs are anchored to heavy loops welded to the ends of the horizontal member, and the lifting devices can be operated positively, locked in position, and adjusted by men standing on solid ground.

GAS TURBINES AND
CENTRIFUGAL COMPRESSORS—5

Station Equipment

by T. R. Rhea* and J. S. Quill*

ADJUSTABLE nozzles were mentioned in the preceding installment. For example, if load were suddenly lost on the load turbine and it should tend to overspeed, the nozzles would be adjusted so that the available heat and pressure energy would be transferred from the load to the high-pressure turbine. Thus the fires would not go out and the load turbine would not overspeed. These nozzles are also automatically adjusted to give better efficiencies at part load.

Lubricating-oil system . . . The turbine and centrifugal-compressor shows a common lubricating-oil system. A shaft-driven lube pump supplies oil to both machines. It is important to supply oil to the bearings before the turbine starts and this is accomplished with a d.c. motor-driven pump operated from the station storage battery. It is also important to maintain lube oil flowing after a machine has shut down to keep the high temperatures, temporarily existing, from flowing to the bearings and damaging them. The d.c. lube pump keeps running 30 minutes after shutdown to keep the bearings cool.

Auxiliary electric power . . . Each gas turbine has a 125-kw., 480-volt, 3-phase, 60-cycle generator for supplying auxiliary power to the station and to its own electric auxiliaries. This power varies in frequency between 45 and 60 cycles as the load on the turbine varies. The auxiliary generator makes the plant completely self-sustaining and it is not necessary to run an auxiliary gas-engine-driven generator in a station when any turbine is running.

* General Electric Co. From paper presented at A.S.M.E. meeting, December 1952.

Description of station . . . Air is brought into turbine through an air washer. This air washer not only cleans the air but also cools it in climates where the humidity is low and thus permits more output from the turbine. The heat exchanger stands on the outside of the station and forms a base for the stack. The operating floor is located about 14 ft. above the base of the heat exchanger in order to leave room for the ducts to and from the heat exchanger. The control room can be located at one end of the building if desired. An inlet-air silencer is connected to the inlet of the gas turbine to insure quiet operation. The heat exchanger acts as a very efficient exhaust silencer. This combination is designed to insure operation that is at least as quiet as conventional steam-turbine power-generating stations. The centrifugal compressor and the connected gas piping usually contribute more noise than the turbine. A fire wall can be inserted in the building.

A 10,000-hp. station requires a building with floor area roughly 48 by 64 ft. including a repair and disassembly area. A 25-ton-capacity crane is usually recommended so that the entire turbine can be lifted as a unit during installation and later if it is necessary.

In a station layout there are three important auxiliary pieces of equipment: (1) a gas-engine-driven generator or other independent source of electric power, (2) a station battery so that turbine can be started even though there is no other source of power, and (3) a water-to-air fin-type exchanger to remove the 20,000 B.t.u. per minute from the lubricating oil and turbine jacket cooling.

Operator's control panel . . . An annunciator is provided to tell the operator whenever an automatic device has functioned. The gas turbine is essentially an automatic device. Very briefly, the control equipment furnished with the turbine is designed to permit the operator to press one button and for the turbine to accelerate, open gas valves, and to load itself and then automatically hold station discharge pressure at a present level. In fact, the operator can have a finger 1,000 miles long for pressing the button if remote supervisory control and suitable communication channels are provided. If the machine gets into trouble, such as hot bearings or excessive vibration, or gas pains around the heart, the control is arranged to shut the machine down, yell for help, and then show the doctor where it hurts.

Station valving . . . A 2-in. valve is placed around the big 30-in. suction valve. This small bypass is used to purge and pressurize the compressor slowly. The station valves can be manually operated from the board or the operator can turn them over to automatic operation if he chooses and they will operate in the proper sequence when the turbine is started.

For an automatic sequence of operation consider that initially the suction, discharge, and purge valves are closed and the vent and station bypass valves are open and that all of the gas turbines are shut down. When the turbine first fires, the purge valve opens. Ten seconds later the vent valve closes and 2 minutes later the suction and discharge valves open. Thus all of the valves (except the vent valve) are open before the load shaft breaks away from rest.

When one turbine has come up to its idling speed and when, in the operator's judgment, the pressure across the entire station is sufficiently equalized, the operator will close the main station bypass valve, using the bypass switch. Subsequent turbines after the first can, of course, be brought up to speed and loaded without disturbing the bypass valve in its closed position.

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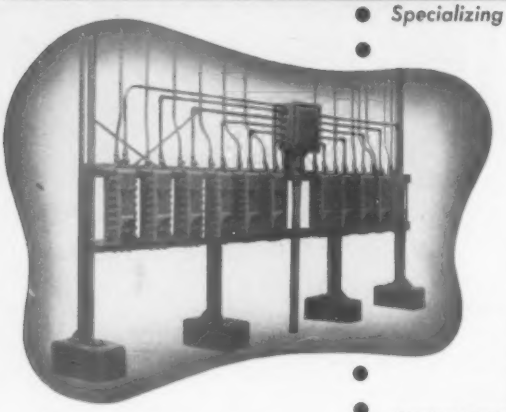

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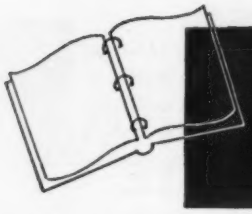

REFINER'S NOTEBOOK

HEATING-TUBE FAILURES—2

High-Temperature Fatigue

by J. J. B. Rutherford*

IT has been noted that earlier high-temperature data were based entirely on the creep rate and that the more recent trend is towards the use of creep-rupture data.

Service conditions . . . Andrade[1] has shown that creep in shear may lead to less deformation than creep in tension. Since a tubular element invokes a triaxial stress distribution which involves some creep in shear, the elongation at rupture might be less than that measured in the laboratory on a simple tensile-type specimen. This same author finds creep on interrupted loading to be higher than creep on constant loading. Only in the idealized laboratory test is it possible to contain unvarying conditions. Service sees continual changes in temperature, stress and manner of stress distribution.

There is a pronounced scarcity of information on high-temperature fatigue, as was recently noted by Dolan.[2] It is quite difficult to perform fundamental studies involving cycling loading at elevated temperatures, since stresses applied to a specimen are computed on the basis of elastic theory, whereas the presence of creep invalidates the basic assumption on which the flexure formula was derived. From the limited test data and observations in the field, it seems a safe premise to consider high-temperature fatigue as analogous to corrosion fatigue mechanism. This implies that at a temperature at which creep is operative, a steady or single cycle of load will cause deterioration to rupture in a determinate time; repetitious loading will decrease the cumulative time. Relating this to still tubes, these will waste away by corrosion and scaling under conditions of no load. The application of stress accelerates wastage, and if the load is cyclic, there is a still further acceleration.

Good mechanical design calls for the use of liberal fillets and freedom from notches. High-temperature design is no exception to this rule. Recent studies[3] have shown that even very sharp notches have little effect on the creep-rupture strength of a material which, in the absence of the notch, exhibits high ductility. With many of the super-alloys, however, where ductility was found to be less than 5 per cent elongation, notches materially decreased the creep-rupture strength.

There has been frequent postulation on the nature and mechanism of creep rupture. If a test could reproduce failure in 1,000 hours, in what condition was the metal after 900 hours? Again analogy might be made to the mechanics of fatigue failure. Wilder and Ketterer[4] have shown that steels exposed for 10,000 hours to the maximum stresses allowed by code, subsequently yielded the same creep-rupture strength as materials exposed without stress, and also new materials. It seems that in the absence of measurable deformation or metallurgical change, material after service is as good as new.

Fabrication of material . . . The quantity of oil that can be heated in a single length of tube is not very great. The maximum length of commercially straight tube is about 40 ft. To economically heat within a combustion chamber, it is necessary to have numerous lengths of tubing, in the order of about 100. This calls for connections at the end, which may be of the hand-hole, header type to permit entry for periodic cleaning, or welded return bends if the product is self-flushing, or if thermal decoking is practiced. With the use of headers, the ends of the tube may be upset so as to reinforce the wall which is thinned by expanding. Whether upset or not, the ends of the tube should be a good fit to permit seating without overrolling. The header seat is generally grooved (some question the benefit of more than one groove), and the header material should be about 40 numbers higher on the Brinell hardness scale to insure good seating.

Welding of return bends or safe ends is generally done in the shop with good facilities for preheating and stress relieving. In the field, it may be necessary to compromise and especially with the deeper-hardening alloy steels, it is necessary to take due precautions.[5] Good welding technique is even more necessary for materials used at elevated temperatures, even though there are some advantages where the stresses will be dissipated during service.

Service . . . In spite of all precautions that are taken in design, heater tubes will fail in service within the prescribed life of the unit.

A failure in an oil still, unfortunately, does not end when one or two tubes have been taken out and replaced. The tubes which are left in the furnace may have been warped and may have suffered less obvious damage. These effects are cumulative and the tube which is cracked in straightening after a fire may continue to give satisfactory service, but ultimately the life of the lube has been reduced.

* Babcock & Wilcox Co., tubular products division. From paper presented at John Zink Process Heating Seminar, Tulsa.

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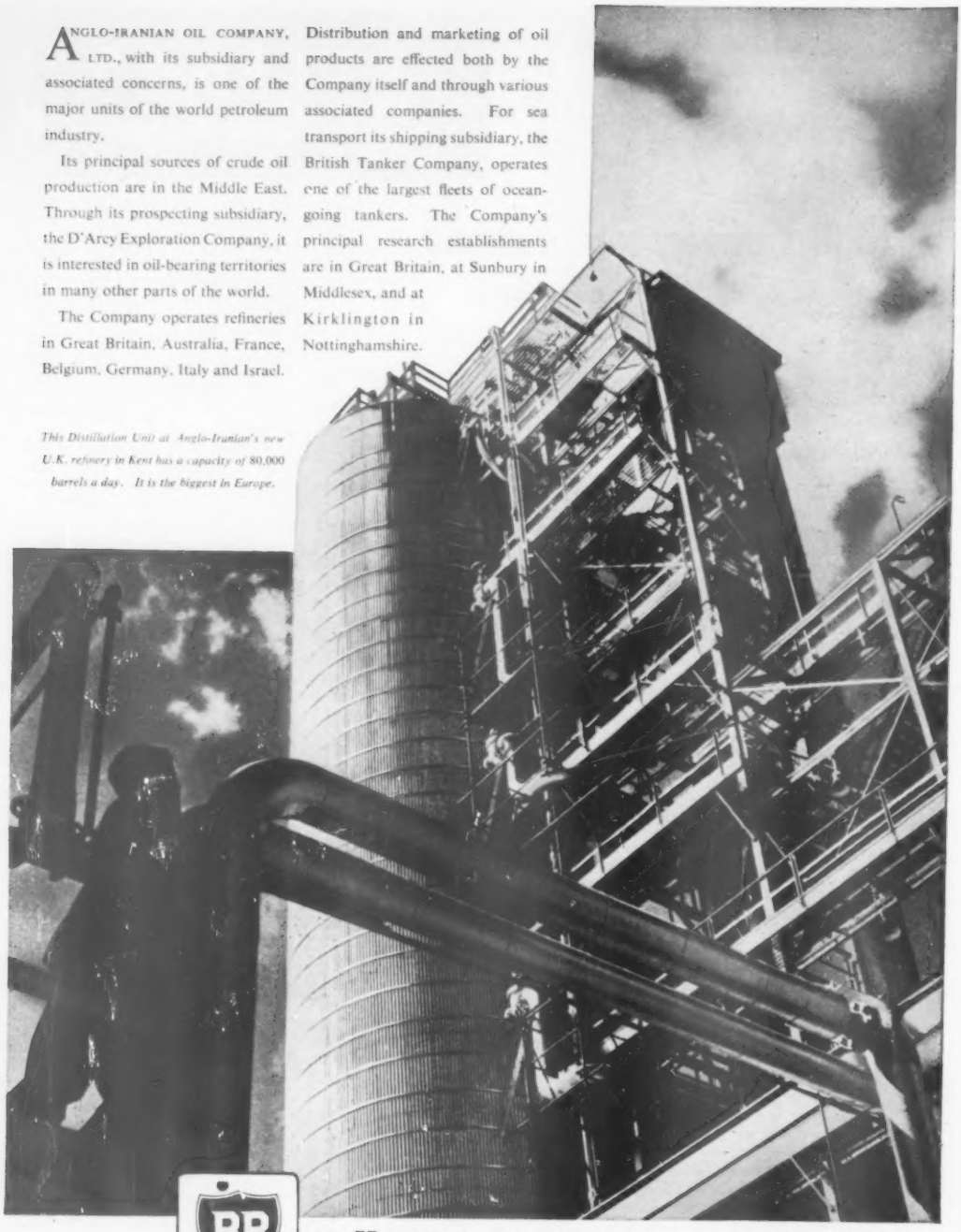

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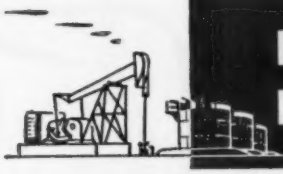

Use of Electric Models in Predicting Production Behavior—Unsteady State

by Ralph F. Nielsen*

IN last week's installment of this series electric models were described which correspond to certain types of steady state flow in porous media. If the flow is not steady state the mass of fluid per unit volume of porous medium will in general change with time. In many cases of natural water drive part or most of the driving energy is due to expansion of the water. Consider, for instance, a large sand formation completely saturated with water under pressure. If water is withdrawn or if it invades an oil zone which is under production there will be expansion, but this will not be uniform over the entire aquifer. Neither will the pressure distribution in general correspond to a steady-state distribution.

For the present purpose we may express the effect of pressure on the density of a liquid as follows:

$$d\rho / dp = c\rho \qquad (1)$$

or

$$\rho = \rho_o e^{c(p-p_o)}$$

$$= \rho_o [1 + c(p - p_o)] \text{ nearly} \qquad (2)$$

where ρ_o is the density at p_o and c is the compressibility coefficient.

An aquifer under pressure may be represented by a system of condensers and resistors arranged as in Fig. 1. Each junction corresponds to a section or "block" of the aquifer. The amount of electricity stored in each condenser is proportional to the potential at that point, just as the excess water due to its compressibility is (approximately) proportional to the excess pressure. The resistors connected at each junction correspond to resistance to fluid flow in the three coordinate directions. The capacity of each condenser is, therefore, governed by the compressibility coefficient and the volume of the block, and the resistors by the permeability, viscosity, and block dimensions. If the aquifer is of uniform thickness and the flow is all horizontal, it could be represented by one layer of resistors and condensers. In an actual electric model the units are joined through a switching panel.

To find the behavior of an aquifer the model is "pressured up" by charging the condensers. For instance 10 psi. might correspond to 1 volt. If the aquifer is "fed" by a constant hydraulic head along one edge, this is represented by keeping a constant voltage along this edge of the model. The resistors end blindly at closed sides. Withdrawals are represented by a current or voltage (lower than the initial voltage) at the proper points, corresponding to the withdrawal rate or pressure at the point of withdrawal. Changes in potential with time at various points are noted.

The quantitative relations may be shown by an example. Consider a completely closed sand of uniform thickness of 100 ft. and in the shape of a rectangle 10,000 by 20,000 ft. The porosity is 15 per cent and the permeability 100 md. It is 100 per cent saturated with water of viscosity 1 cp. and compressibility coefficient $c = 3 \times 10^{-6}$ per psi. The original rock pressure is uniform at 4,000 psi. Withdrawals of 100 cu. ft. per day at one of the short sides are begun and it is desired to know how the pressure distribution will change with time.

If we were interested only in the aquifer we could consider a tube of unit cross-section, since the flow is linear. However, in an oil-field analysis the water-drive model is joined to a model of the oil pool and relative dimensions must be preserved. We may consider it cut into 10 slices perpendicular to the direction of flow. The pore volume of each slice is $0.15 \times 10{,}000 \times 2{,}000 \times 100 = 3 \times 10^8$ cu. ft. A slice is represented by a capacitor of 1 mf. which will store 10^{-6} coulombs per volt. One volt corresponds to 10 psi. which will cause a volume change of $10 \times 3 \times 10^{-6} \times 3 \times 10^8$ or 9,000 cu. ft. If the capacitors are joined by resistors of 100,000 ohms a drop of 1 volt between each causes a flow of 10^{-5} amp. The corresponding 10-lb. drop between "slices" would flow:

$$\frac{10 \times 0.1 \times 100 \times 10{,}000 \times 30.5^2}{14.7 \times 1 \times 2{,}000 \times 30.5 \times 30.5^3}$$

or 0.0365 cu. ft. per second. Hence 1 μa. = 0.00365 cu. ft. per second or 315 cu. ft. per day. One microampere will discharge a 1-mf. condenser, previously charged to 1 volt, in 1 second. A flow of 315 cu. ft. per day (= 1 μa.) will move the 9,000 cu. ft. represented by the capacitor in 28.5 days. Thus 1 second on the model is equivalent to 28.5 days on the formation.

To find the pressure change due to the withdrawal rate of 100 cu. ft. per day, the condensers are all charged to 400 volts, as required by the original pressure. A current corresponding to the withdrawal rate is allowed to flow from one end of the system. This is 100/315 μa. Pressure changes are obtained by voltmeter readings at the various points, and the time converted.

This particular problem is not of much practical interest. If an oil reservoir is driven by expansion of a water reservoir a model of the oil pool may be made with metal foil or a layer of solution. Resistances and capacitors, if used, are made to correspond with the same scaling as in the water reservoir. The aquifer model may be joined to the oil pool model by making contact along an edge, or all around the pool in accordance with what is suspected in the natural formation. The "wells" are "produced" by drawing appropriate currents.

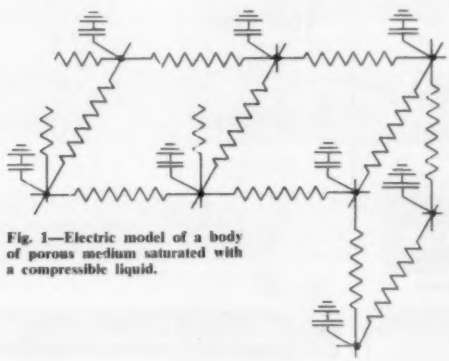

Fig. 1—Electric model of a body of porous medium saturated with a compressible liquid.

*Associate professor, petroleum and natural-gas engineering, Pennsylvania State College.

Reference

W. A. Bruce, A.I.M.E. Trans. 1942-43, p. 318.

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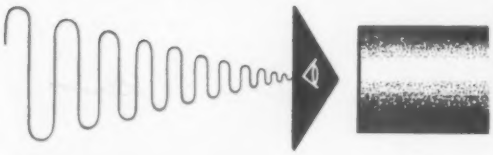

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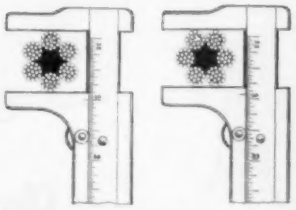
Use and Care of Wire Rope—5*

PREVIOUS installments on care and handling of wire rope contain information on storage and preparation for use. Also, two methods for properly seizing rope prior to cutting have been presented.

How to measure . . . The true diameter of a wire rope is the diameter of the enclosing circle which is tangent to the crowns of the strands. To ascertain this, the measurement is taken across the rope from the crown of one strand to the crown of the strand directly opposite. In using a caliper do not place the jaws against two strands side by side. This latter procedure will register a measurement smaller than the true diameter.



Showing correct (left) and incorrect (right) ways to measure wire rope.

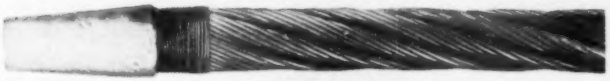
* Taken from Bulletin 61, Use and Care of Wire Rope, A. Leschen & Sons Rope Co.

End Preparations

Most ropes are shipped with the ends seized as they are prepared for cutting—two or three wrappings in the case of regular nonpreformed rope, one on preformed rope and 5 or 6 on 18 by 7 nonrotating rope. Seized ropes can usually be installed without further preparation. In some cases tight openings in drums and wedge sockets, or complicated reeving require special end preparation. Then the strands must be tightly held without increasing the rope diameter. In such cases the ends are tapered and welded, tapered and speltered, or the ends fused. It is sometimes necessary to provide a loop or becket or a link to which a lighter line is fastened to pull the rope into place or around sheaves. Some of these special end preparations are shown on this page. Special seizings are sometimes applied to properly hold the strands when a wedge socket is used.

Seized end.

Tapered and welded end.



Tapered and speltered end.

Tapered and speltered end with loop.

Fused end with link.

Plain fused end.

Seized end with loop.

A.A.O.D.C. Safety Tips

Fire is one of the major winter hazards, not only because of the number of heating devices used, but also because, once started, a conflagration is difficult to arrest in windy, icy weather.

Falls are among the most frequent of winter mishaps. Icy steps, steep inclines and sharp turns must be negotiated with care. Ample time should be allowed to get across thoroughfares. Stairs coated with ice are perils. The hazards of ice may be lessened by sprinkling calcium chloride, coarse ashes or sand on the slippery surfaces. Handrails and fixed mats are useful in helping to prevent falls.

Chains, bars, hammers, tongs, and hooks may snap in winter under strains they could withstand at warmer temperatures. Lighter loads should be handled and care must be taken to avoid jerking hoisting cables.

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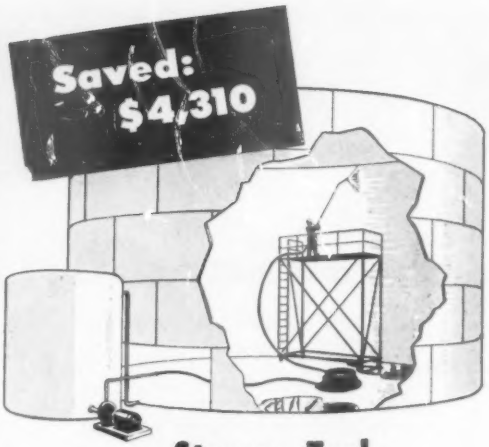

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QUESTIONS ON TECHNOLOGY

by W. L. Nelson
Technical Editor

Sulfur Content of Petroleum Coke

"How is the sulfur content of petroleum coke related to the sulfur content of the feed stock? How high can the sulfur content be in the crude oil and still make satisfactory coke?" R. S. P.

About the only statement in the technical literature about the sulfur content of coke is that of Charles L. Thomas (Petroleum Coke and Coking, Progress in Petroleum Technology, New York meeting, American Chemical Society, September 1951, p. 278). He states, "Sulfur will range from 0.2 to 4.2 per cent or higher—i.e., a little higher than sulfur in the oil being cracked."

The editor of this page finds the same general situation. Scant information indicates that the sulfur content of asphalt (1,000° F. mid boiling point) cracked fuel oil, and coke, are about the same (see Table 1). In general it seems that the ratio of per cent sulfur in coke to sulfur in crude oil is higher for the low-sulfur (or high-gravity) crude oils. By making many estimates of the sulfur content of crude oils it was possible to make the comparison shown in Table 2 and Fig. 1. The data of Table 2 are not entirely consistent nor is the plot of sulfur contents shown in Fig. 1.

Finally, Table 3 indicates the general relationship between the sulfur contents of residue materials and the sulfur contents of parent crude oils or cracking stocks. This table was presented separately because it is based mainly on estimates of sulfur contents taken from the following Questions on Technology:

Nov. 10, 1952, p. 171—Thermal Cracking—West Texas.

Nov. 24, 1952, p. 137—Thermal

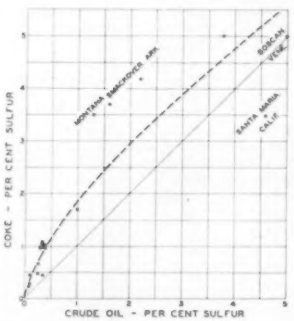

Fig. 1—Estimate of the sulfur content of petroleum cokes.

TABLE 1—SULFUR CONTENT OF RESIDUES, WEIGHT, PER CENT

	Crane Co. West Texas crude 2.03 per cent sulfur	Boscan (1) Venezuelan 10° A.P.I., 5 per cent sulfur	Smackover, Arkansas 1.9 per cent sulfur
800° F. Mid B.P.	2.44	4.3	2.18
1,000° F. Mid B.P.	3.5	5.1	3.1
Cracked No. 6 fuel oil	2.94	6.45	3.27
Coke	3.06	5.0	3.95
Ratio—S in coke to S in 800° F. feed	1.25	1.16	1.81
Ratio—S in coke to S in crude oil	1.51	1.0	2.08

TABLE 2—APPROXIMATE RELATIONSHIP OF PERCENTAGE SULFUR IN COKE TO PERCENTAGE SULFUR IN PARENT CRUDE OIL

Name—	Crude oil— A.P.I.	Crude oil— Per cent S	Per cent S in coke	Ratio—S in coke over S in crude oil	Reference
Unknown		3.78	5.0	1.32	(3)
Boscan, Venezuela	10	5.0	5.0	1.0	(1)
Santa Maria, Calif.	*14	*4.6	3.47	0.75	(2)
Smackover, Ark.	*19	*2.2	4.18	1.9	(4)
Crane County, W. Texas	*31	2.03	3.06	1.53	(11)
Smackover, Ark.	*22	*1.6	3.7	2.3	(4)
Montana		*1.3	3.5	2.7	(6)
Ardmore, Okla.	36	1.0	1.7	1.7	(5)
Panhandle, Texas		*0.35	0.45	1.29	(4)
Ohio and Illinois		*0.38	1.02	2.68	(7)
Mid-Continent	*36	*0.34	0.99	2.92	(4)
Mid-Continent	*38	*0.33	1.05	3.18	(6)
Mid-Continent		*0.33	0.97	2.96	(8)
Mid-C. and E. Texas	*37	*0.31	0.99	3.19	(6)
Lima, Kans., Ill.	*39	*0.33	0.97	2.96	(9)
Kentucky		*0.25	0.47	1.88	(6)
Kentucky		*0.25	0.66	2.64	(4)
Comodoro Riva., Argentine		*0.10	0.26	2.6	(10)
Pennsylvania		0.08-0.10	0.22-0.45	2.75-4.5	(4) and (5)

*Estimate.

TABLE 3—COMPARISON OF SULFUR CONTENTS OF COKES AND CRACKED FUEL OILS WITH THE SULFUR CONTENT OF VARIOUS CHARGE STOCKS

	Mississippi			W. Texas		Venezuelan			Wyoming		Middle East		Smackover, Arkansas
Per cent S in crude—	1	2	3	1	2	1	2	3	1	2	1	2	2
600° F. charge stock	0.54	1.04	1.32	0.81	1.6	0.65	1.2	1.71	0.81	1.6	1.08	1.52	1.04
800° F. charge stock	1.4	2.16	2.72	1.07	2.44	1.15	1.92	2.46	1.07	2.44	1.7	2.5	2.18
1,000° F. charge stock	1.95	3.10	4.2	1.4	3.5	1.68	2.56	3.21	1.4	3.5	2.3	3.4	3.10
Cracked fuel oil	1.99	2.88	3.63	1.63	2.94	1.72	2.88	3.69	1.92	4.4	2.26	3.32	3.28
Coke	*2.19	*3.17	*4.0	*1.79	3.06	*1.89	*3.17	*4.06	*2.12	*4.85	*2.48	*3.66	3.94

*Estimated as 10 per cent higher than in cracked fuel oil.

Cracking—Other Crude Oils.

Sept. 6, 1952, p. 112—Straightrun Distillate Fuels.

September 13, 1951, p. 135—Other Straightrun Products.

Cokes containing up to 2 per cent sulfur are usually acceptable for the manufacture of carbon electrodes for aluminum manufacture. For other metallurgical purposes, 1 per cent sulfur in either fuel oil or coke is often considered as a maximum. From Fig. 1, it can be seen that crude oils that contain more than about 0.4 per cent of sulfur are usually unsatisfactory for the production of metallurgical coke whereas crude oils that contain less than 1.1 per cent sulfur may produce satisfactory cokes for aluminum manufacture.

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Sulfur Content of Flue Gases

"We are switching from coal to fuel oil and we are concerned over the sulfur content of the flue gas. How does fuel oil compare with coal with respect to sulfur?" M.G.R.

It is obvious that the sulfur content of fuels and of flue gases varies widely, but something of the situation can be judged from Table 1. The average for oil of 60 grains per 100 cu. ft., shown in the table, appears to be low and may be based on the metallurgical type fuel oils used in the metal industries. It seems probable that the sulfur content of flue gases from coal is higher than from fuel oil for Mid-Western parts of the United States (perhaps 80 grains for oil and 248 for coal) but on the eastern seaboard, the gas produced from coal is probably lowest in sulfur (perhaps 80 grains for coal and 98-147 for oil).

Inasmuch as natural gas supplied in large quantities is substantially free of sulfur, the flue gas should normally contain less than 10 grains of sulfur dioxide per 100 cu. ft., and the same applies to desulfurized coke oven or producer gas (6 grains). Unpurified producer gas when burned produces a flue gas that contains about 125 grains of sulfur.

TABLE 1—SULFUR CONTENT (SO_2) OF FLUE GASES

Per cent sulfur	Fuels: Bituminous coal	Fuels: Residual fuel oil	Grains SO_2/100 ft.³: Coal	Grains SO_2/100 ft.³: Oil
0.5	Eastern (best)		25	
1	Eastern	Lowest sulfur	62	49
***1.22**	**Eastern (about average)**	**Average***	**76**	***60**
2	Eastern and Mid-Western	**East Coast**	**124**	**98**
3	Mid-Western	From 13-20 A.P.I. crude oils	186	147
4	**Mid-Western (average)**	Middle East crude oils	**248**	196
5	Mid-Western	Highest sulfur	310	235
8	Lowest grades		496	

*Average fuel oil according to H. R. Clauser, Heat Resisting Castings, Their Selection and Application, Materials and Methods, Oct. 1950, p. 79.

Estimate of Price Changes Of Alloy Steels

"What is the price of stainless steels? I have some old prices but how have they changed since 1940?"—S. M. T.

No complete source of costs is available except, of course, the manufacturers of alloy steels. Costs vary so widely depending upon the kind of material (bars, wire, rod, billets, plate, strip, etc.) as well as its alloy content, that exact prices can only be obtained by quotations.

However, the changes in price can be stated with fair accuracy. The Cost Indexes of Table 1 were prepared from prices published in Wholesale Prices (U. S. Department of Labor, Bureau of Labor Statistics) and from other scattered data.

The various shapes in which steel is produced greatly affects the price. Relative to "forging billets," the prices of other alloy steel shapes are:

Forging billets	100
Bars, drawn wire, structurals	117 (111-118)
Strip:	
Hot rolled	119 (99-167)
Cold rolled	155.5 (125-236)
Plates	135.5 (125-167)
Sheet	162 (127-219)
Seamless tubes	213 (approx.)

Typical costs of a few typical materials are (1951):

	Ct. per lb.
4-6 chromium—tubes	30
4-6 chromium—bars	16
13 chromium—sheet	50
18-8 stainless tubes	95

TABLE 1—COST INDEXES OF ALLOY STEELS—1946 = 100

Year	S.A.E. 3120 bars	5 per cent chrome Type 501 bars	18 per cent chrome Type 430 strip	Carbon boiler tubes	Iron and steel	Estimate alloy steels
1926	92.7	.....	.....	85.2	80.0	.....
1937	*94.0	*92.0	*93.0	*92.0	92.0	92.0
1940	*92.5	*88.0	*90.0	*90.0	88.0	89.0
1944	92.5	*88.0	*90.0	91.8	88.0	89.0
1945	94.4	*91.0	*92.0	91.8	91.0	92.0
1946	100.0	100.0	100.0	100.0	100.0	100.0
1947	120.3	*120.0	*115.0	115.0	117.0	117.0
1948	135.8	133.0	130.0	135.0	141.0	131.0
1949	150.5	*155.0	*133.0	140.9	143.3	140.0
1950	156.3	*170.0	*140.0	149.5	152.9	152.0
1951	*165.0	*185.0	*157.0	163.3	166.7	169.0
1952 (Nov.)	175.1	204.0	163.0	180.0	171.8	181.0
Cents per lb. 1946	3.75	7.3	19.9	6.7	.....	varies

*Estimated.

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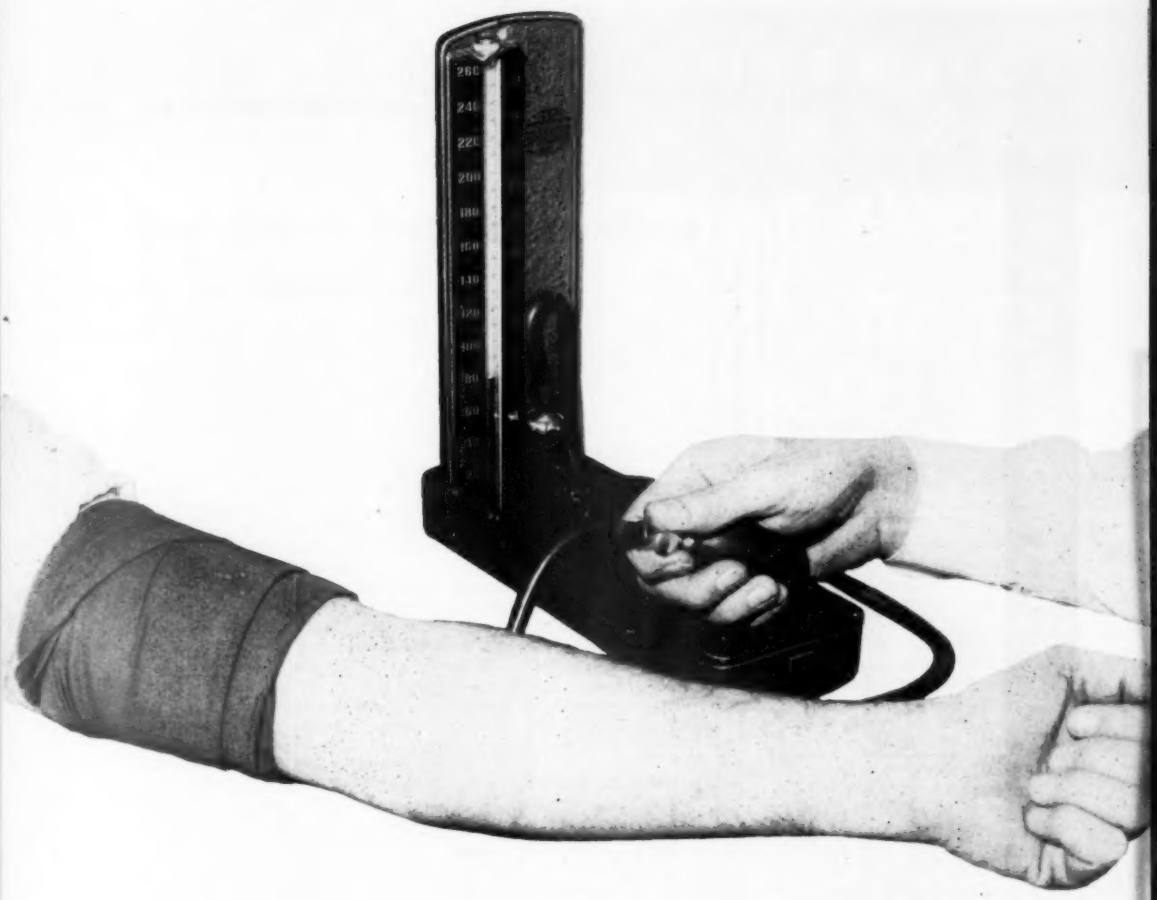
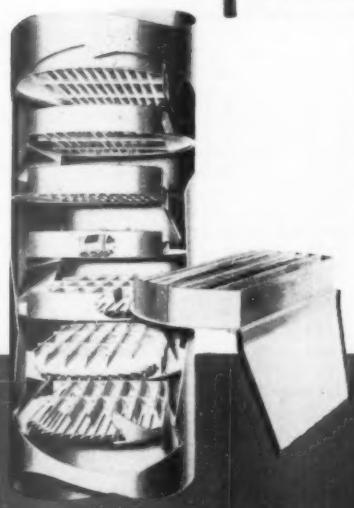


Is pressure drop your problem?



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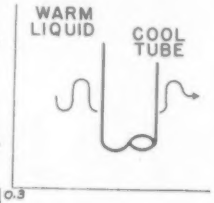
Part 27 of a series

by Dr. B. E. Lauer, Head, Department of Chemical Engineering, University of Colorado

h_f HEAT TRANSFER

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of a COOL TUBE and WARM LIQUID



Tube Position: Vertical

Liquid Movement: Turbulent

Direction of Movement: Normal to tube.

EQUATION:

$$h_f = 0.38 \frac{K}{D_o}\left[\frac{D_o V \rho}{\mu}\right]^{0.56}\left[\frac{c\mu}{k}\right]^{0.3}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr. sq. ft. $^{o}F.$

k - Thermal conductivity of liquid at t_f, BTU/hr. sq. ft. $^{o}F./ft.$

ρ - Density of liquid at t_f, lb./cu. ft.

μ - Viscosity of liquid at t_f, lb./ft. hr.

C - Specific heat of liquid, BTU/lb. $^{o}F.$

t_f - Average temperature of liquid film, $^{o}F.$

V - Velocity through minimum free area, ft./hr.

D_o - Outside diameter of tube, ft.

RESTRICTIONS: No limitations have been set on the Reynolds number except that flow should be turbulent.

SOURCES OF DATA:

For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

for ρ -- see pp. 130-140, 175-195, 1583.
μ -- see pp. 370-374, 1198, 1696.
k -- see pp. 450-451, 1303, 1697.
C -- see pp. 225-235, 297, 1188, 1696.

REFERENCES:

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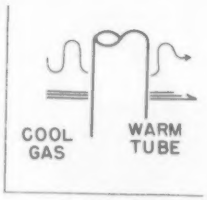
2. "Refrigerating Data Book", ASME, p. 88 (1937-1938).

3. Applied Heat Transmission, Herman J. Stoever, p. 88.

I 2 c

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of a WARM TUBE and COOL GAS



Tube Position: Vertical

Gas Movement: Streamline Flow
Turbulent Flow.

Direction of Movement: Normal to tube.

There is no differentiation made between heating or cooling a gas in passing it over a single tube in a direction normal to the axis of the tube.

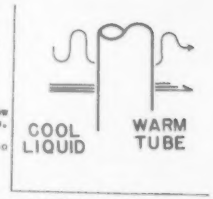
Reference should therefore be made to equations

I 1 b
and I 1 c

for equations applicable to heating a gas by passing it over a vertical tube in a direction normal to its axis.

I 4 b and c

COEFFICIENT of HEAT TRANSFER through FILM between OUTSIDE SURFACE of a WARM TUBE and COOL LIQUID



Tube Position: Vertical

Liquid Movement: Streamline Flow
Turbulent Flow.

Direction of Movement: Normal to tube.

There is no differentiation made between heating or cooling a liquid in passing it over a single tube in a direction normal to the axis of the tube.

Reference should therefore be made to equations

I 2 b (1),
I 2 b (2),
and I 2 c.

for equations applicable to heating a liquid by passing it over a vertical tube in a direction normal to its axis.

I 5 b and c

by Marshall E. Parker*

Does Cathodic Protection Constitute A Fire Hazard?—1

THE question has been raised several times recently as to the possible fire hazards in connection with cathodic protection systems. It must be admitted that there are some hazards involved in the installation and operation of cathodic protection equipment; however, there are none which cannot be eliminated by correct design — design which recognizes the possibilities, and which takes into account the effects of the unexpected occurrence.

On a section of simple cross-country pipe line, whether it be oil or gas, or any other fluid, the fire hazard due to the presence of cathodic protection is nil. The only locations on a pipe line in the open country which can even be imagined to present a fire hazard are locations at which there is some kind of discontinuity in the line, or at special points with reference to the cathodic-protection system, or at locations where the line (under special cricumstances) is very close to another extensive metallic structure. These hazards can be examined one by one.

At a rectifier unit itself, there is, in general, no greater hazard than in the vicinity of any piece of electrical equipment. The ordinary cathodic protection rectifier is a reasonably well-behaved device, and electrical failures which do occur rarely have any effect other than on the equipment within the case. This is particularly true with oil-immersed units; it is difficult to imagine any great hazard. It might safely be assumed that a cathodic-protection rectifier is about as safe as a conventional distribution transformer—provided, of course, that it is installed with the same degree of care, that all connections are properly made, that the unit is adequately protected against overloads.

Insu'ated joints in pipe lines, under certain conditions, can present very real hazards. It is highly probable that such a joint separates two sections of line, one of which is under cathodic protection; if both sections are under protection, the degree will not be exactly the same at the point of the flange. There will exist, then, a potential difference across the flange. This difference will be quite small; it may range from a few millivolts to perhaps 2 or 3 volts. At first glance it does not seem possible that a potential so small could produce an arc or spark capable of igniting even the most flammable or explosive vapors. It must be remembered, however, that the resistance to earth of a long section of a pipe line, even when well coated, is only a small fraction of an ohm. Consequently it is possible to draw an arc of several amperes by accidentally short-circuiting an insulated joint. Such an arc can be drawn with a wrench or screwdriver, and, when broken, is quite capable of igniting flammable vapors.

Flange Locations

The obvious approach to the elimination of this hazard is the proper choice of locations for the installation of flange insulation. The temptation is great to save a few dollars by making the installation on an existing flanged joint, in a valve box or scraper trap. The valve box is hazardous; the scraper trap is an outright invitation to disaster. Buried joints may be insulated without undue hazard (such joints should be coated to prevent current leakage); joints aboveground, if the location does not present any great risk of flammable vapor, are usually acceptable; joints installed in a pit or box serving no other purpose are safe, if precautions are observed when any work is to be done upon them.

The same danger which exists at an insulated joint is present at any joint in a line under protection, if flanges are unbolted or fittings otherwise disconnected. Whatever current is present in the line at that point will be interrupted when the joint is broken. If the fluid being carried is capable of forming flammable vapor, there is every reason to expect some to be present at such a time.

The remedy for this condition lies, not in design or in construction, but in operational procedure. Before any joint on any pipe line carrying a potentially combustible fluid is opened, or before such a line is cut, a metallic bond should be established which will bridge the gap. This bond may be a heavy copper cable (such as welding cable) or may be improvised out of any available metal. If the disconnection is temporary, the bond should be left in place until the continuity of the line has been restored. If it is desired to make the separation permanent, then provision should be made when installing the bond so that it can be interrupted at a location where an arc will not be dangerous. Under some circumstances this can only be accomplished by the use of a bonding cable especially prepared for the purpose, with an explosion-proof switch included in the cable. Such a device can be opened in complete safety under very hazardous conditions.

Within tank farms or refinery areas where there are a number of different lines within a single pit, either with or without fittings and valves, it is an excellent practice to bond all the lines solidly together by a metal band running entirely around the pit, welded to every line where it enters or leaves. With a permanent bond of this type in place, no temporary bonding will be required for any kind of work which may have to be done while servicing or replacing valves or other fittings.

It is clear that following this procedure would make it necessary to apply cathodic protection to all of the piping within an area if it is to be applied to any—and, indeed, this procedure is strongly to be recommended, not only from the standpoint of avoiding the hazard of fire and explosion from accidental short-circuits between protected and unprotected structures, but also from the standpoint of obtaining a balanced cathodic protection system, with the minimum danger of interference or stray current damage to structures not included in the system. A cordon should be thrown around any area to be protected, and all piping and other structures of metal which cross this line should be insulated at or very near to the line.

*Consulting engineer, Houston.

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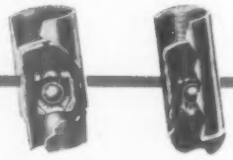

At left are shown the Larkin Regular Float Shoe (Fig. 302) and the Larkin M&F Float Collar (Fig. 401 M&F).

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Poidometer for Control of Granular Material

by Porter Hart* and R. C. King†

THERE are numerous types of poidometer on the market. Each of these had some disadvantage which made it unsuitable for the control of wet oyster shell feed to a kiln. Those with suitable sensitivity were not sufficiently rugged nor adequately protected from the corrosive conditions. Those that were rugged enough were not sufficiently sensitive.

The kiln feed belt was originally equipped with a mechanical scale, connecting the weight-sensitive roller through linkages directly to the feed gate. The feed rate adjustment was by means of loading the scale beam with weights. This poidometer was insensitive because it depended upon mechanical linkages and could not supply the power to adjust the feed gate adequately. It also had no means of recording the belt load so it was impossible to calculate a material balance for the process.

A pneumatically operated poidometer including a load recorder was developed from components of standard instruments with a minimum of change in the existing equipment. The modified poidometer with the arrangement of these additions is shown in Fig. 1. The linkage between the pivoted roller and the scale beam was replaced with an air-loaded balance which is a standard control-valve diaphragm motor, with the spring removed. The area of this diaphram and the length of the lever arm were so arranged that when in balance each pound of air pressure to the pneumatic balance equals a pound of load per foot on the feed belt.

A standard valve positioner was used as a load controller to maintain the balance between the air loading and the load on the belt. The output of the positioner was connected externally to a piston-type pneumatic operator used to regulate the feed by adjusting the hopper gate. The output pressure was also fed by adjusting the hopper gate. The output pressure was also fed back to the control bellows of the positioner for stability.

This arrangement permits the recorder and the load adjusting valve for the poidometer to be located at the control end of the kiln. By using the poidometer record and the footage counter on the feed belt, material balances can easily be calculated for production records.

This pneumatic poidometer proved to be very rugged and sensitive. Its action is positive and immediate with no cycling. It has been in trouble-free operation for over 5 years.

*Superintendent, and †assistant superintendent instrumentation, Dow Chemical Co., Freeport, Tex. Presented at symposium on Instrumentation for the Process Industries, A. & M. College of Texas, 1953.

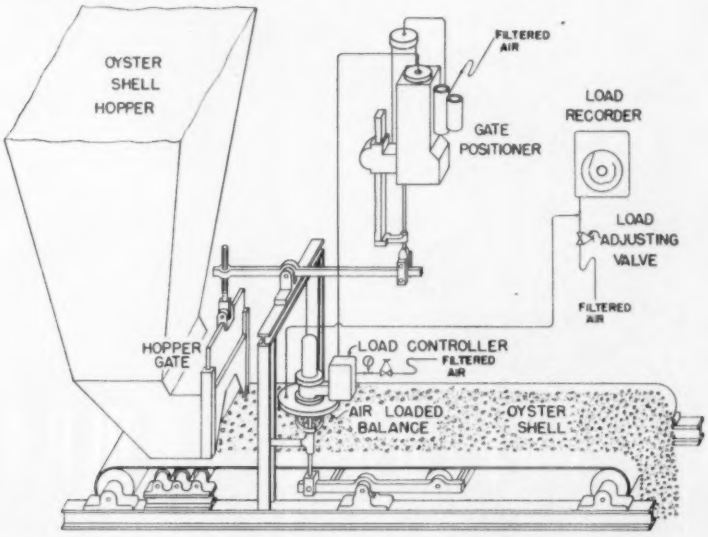
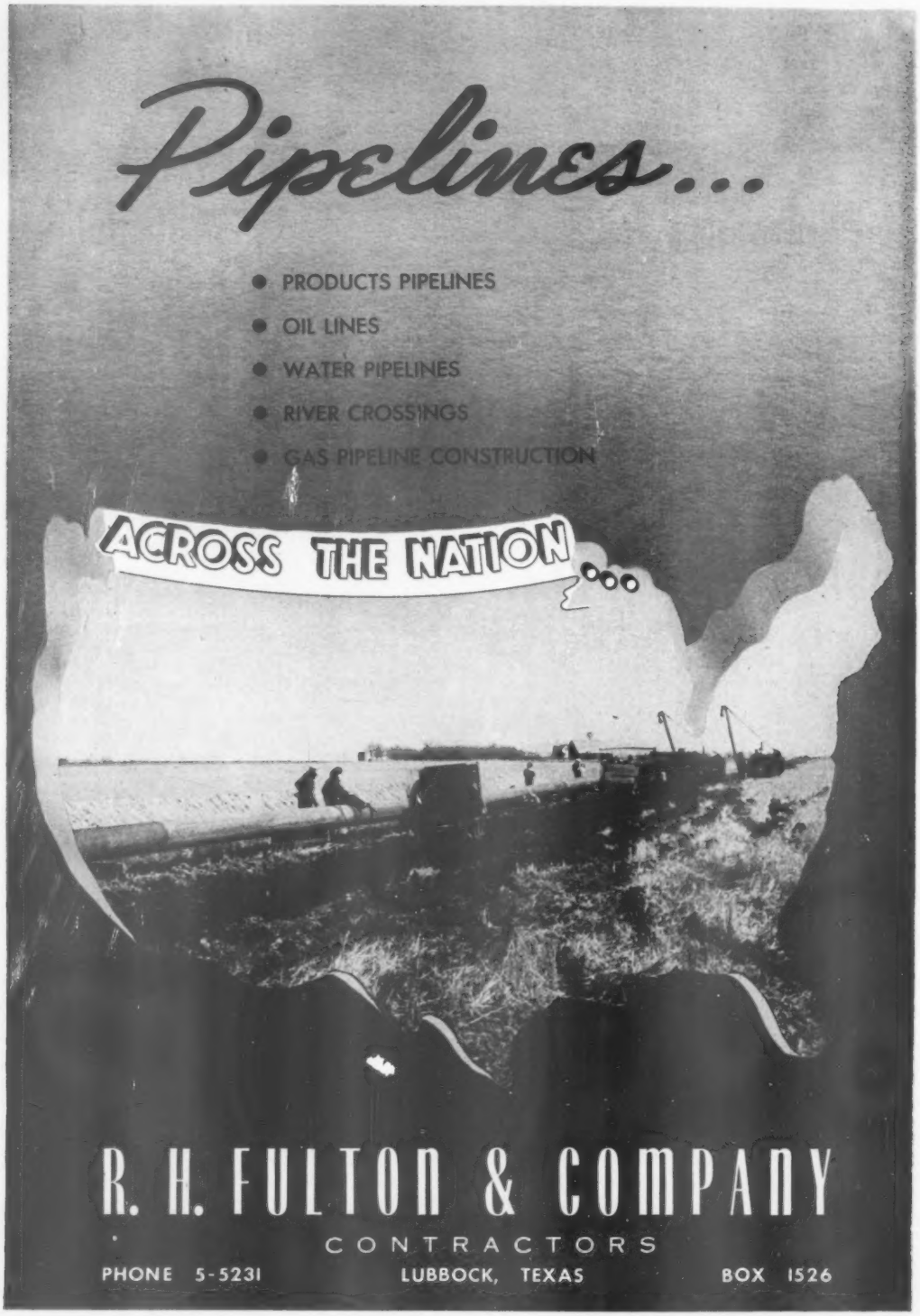


Fig. 1—Poidometer for shell feed control.


Pipelines...
PRODUCTS PIPELINES
OIL LINES
WATER PIPELINES
RIVER CROSSINGS
GAS PIPELINE CONSTRUCTION
ACROSS THE NATION
R. H. FULTON & COMPANY
CONTRACTORS
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LUBBOCK, TEXAS
BOX 1526

Pipe-Line Construction

PIPE-LINE activity as reported below by The Oil and Gas Journal is compiled from information received from pipe-line companies and contracting firms.

These projects include those planned, proposed, under way, and contracted. Uncontracted projects are indicated by a • preceding the company name.

Crude-Oil Pipe Lines

• **California-Oregon Pipe Line System**—103 miles, 6-in., proposed, Crescent City, Calif., to Medford, Oregon.

• **Cities Service Pipe Line Co.**—64 miles, 18-in., under way, Sour Lake, Tex., to Lake Charles, La. Associated Pipe Line, contractors. Completion date April 1953.

• **Cooperative Refinery Association.**—48 miles, 6-in., planned, Phillipsburg, Kans., to Holdredge, Neb. Begin 3-53.

• **R. A. Goodall.**—45 miles, 6-in., planned, Little Beaver to Merino, Colo. (To connect with Sterling system).

• **Gulf Oil Co.**—22 miles, 8-in., planned, Portilla field, Texas, to Corpus Christi.

• **Gulf Refining Co.**—55 miles, 10-in., planned, Bay Marchand to Plaquemines, La.

• **Humble Pipe Line Co.**—71 miles, 16-18-in., planned, East Texas to Louisiana-Texas border. (30 miles of 16-in., and 41 miles of 18-in.) Completion date 10-53.

Under way, Hawkins field, Woods County, Texas, to Longview.

Start 7-1, Longview to Louisiana border.

• **Interstate Oil Pipe Line Co.**—22 miles, 18-in., planned, Texas to Shreveport, La.

68 miles, 16-in., planned, Raceland to Anchorage, La. Begin 5-53.

137.6 miles, 22-in., planned, Shreveport to Baton Rouge.

• **Lakehead Pipe Line Co.**—635 miles, 30-in., proposed, Superior, Wis., to Sarnia, Ontario, Canada.

Mackinac Pipe Line Co., Inc.—97 miles, 30-in., start 5-1, Cooks to St. Ignace, Mich. Midwestern Constructors, Inc.

• **Magnolia Pipe Line Co.**—29 miles, 8-in., planned, Midland County, Texas area.

47 miles, 4-6-8-in., planned, Nolley field, Andrews County to Magutex field, West Texas.

• **Pasotex Pipe Line Co.**—146 miles, 10-in., planned, Snyder to Wink, Tex.

• **Phillips Pipe Line Co.**—45 miles, 12-in., planned, Rancho system to Sweeny, Tex. 6-53.

• **Platte Pipe Line Co.**—93 miles, 12-14-in., planned, Chatham station near Worland, Wyo., to Oregon basin, and Byron field. R. H. Fulton Co. Completion date 6-53.

Chatham, Wyo., to Oregon basin. R. H. Fulton Co.

Oregon basin to Byron-Garland field. R. H. Fulton Co.

• **Progress Pacific Pipeline Co.**—1,100 miles, 24-in., planned, Odessa, Tex., to Los Angeles Harbor, Calif.

• **Pure Transportation Co.**—45 miles, 8-in., planned, Kimball to Gurley, Neb.

• **Roosevelt Oil & Refining Corp.**—22 miles, 4 and 6-in., planned St. Helens to Norwich, Mich.

• **Service Pipe Line Co.**—185 miles, 16-in., planned, Bowie, Tex., to Drumright, Okla.

30 miles, 6-in., Knox and Haskell counties, Texas.

29 miles, 4-6-8-in., proposed, Natrona County, Wyoming.

170 miles, 12-in., proposed, Tioga to Williston, N. D.

41 miles, 4-6-8-in., planned, Williams and Mountrail counties, North Dakota.

• **Texas-New Mexico Pipe Line Co.**—48 miles, 8-in., planned, from Lovington, N. M.

Texas Pipe Line Co.—34 miles, 6-in., under way, Sour Lake to Port Arthur, Tex. Houston Contracting.

• **West Coast Pipeline Co.**—960 miles, 20-22-in., planned, Midland, Tex., to Norwalk, Calif.

Products Pipe Lines

H. W. Bass & Sons., Inc.—152 miles, 4-6-in., proposed, Duval and Live Oak counties, Texas, to Corpus Christi, Tex.

• **Bell Oil & Gas Co.**—150 miles, 6-8-in., planned, Ardmore to Drumright, Okla. Completion date 6-1-53.

Buckeye Pipe Line Co.—370 miles, 10-14-16-in., under way, Linden, N. J., via Allentown, Pa., to Auburn, Syracuse, Waterloo, and Rochester, N. Y.

Contracted, Allentown, Pa., to Auburn, N. Y. Completion date 10-53.

Contracted, Auburn to Syracuse, N. Y. Completion date 10-53.

Contracted, Syracuse to Caledonia, N. Y. 10-53.

• **Coastal Products Pipe Line Co.**—260 miles, 20-in., proposed, Houston to Baton Rouge.

• **Continental Pipe Line Co.**—(Yellowstone Line)—600 miles, 8-in., planned, Billings, Mont., to Spokane, Wash.

• **Harbor Products Systems**—86 miles, 16-in., planned, Woodbury Junction, Philadelphia to Trembley Point, N. J. (Joint ownership of Sinclair Pipe Line Co., Gulf Oil Corp., and Texas Co.)

Indiana Farm Bureau Cooperative Association, Inc.—180 miles, 8-in., under way, Mt. Vernon to Indianapolis, Ind. R. B. Potashnick, contractor.

70 miles, 4-in., under way, Indianapolis to Peru, Ind. R. B. Potashnick, contractor.

Inland Empire Pipe Line Co.—504 miles, 10-in., proposed, Billings, Mont., to Spokane, Wash.

• **Kaneb Pipe Line Co.**—236 miles, 8-in., planned, Wichita and Potwin, Kans., to Fairmont, Neb.

• **Phillips Petroleum Co.**—54 miles, 6-in., planned, Goldsmith to Borger, Tex.

52 miles, 10-in., planned, Shell's Brookshire system to Sweeny, Tex. 5-53.

• **Plantation Pipe Line Co.**—82 miles, 14-in., planned, Charlotte to Greensboro, N. C.

Salt Lake Pipe Line Co.—140 miles, 8-in., Pasco to Spokane, Wash. Completion date 6-53.

Sinclair Pipe Line Co.—85 miles, 12-in., under way, Sinco to Port Arthur, Tex. Completion date 3-53.

Standard Oil Co. (Ind.).—316 miles, 12-in., under way, Sugar Creek refinery to Dubuque, Iowa.

Under way, Polo, Mo., to Unionville, Mo. Sheehan Construction Co.

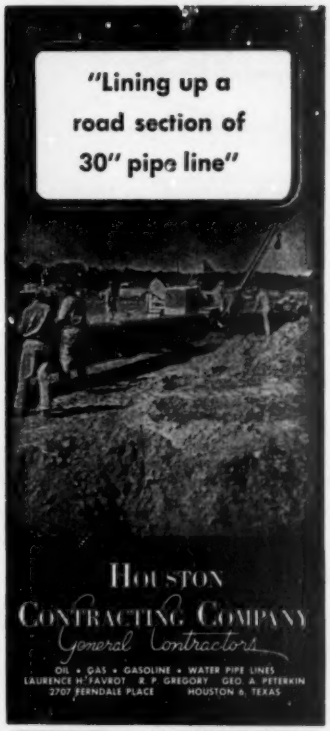
Under way, Unionville, Mo., to Dubuque, Ia. O. R. Burden Const. Corp.

Planned, Mandan, N. D., to Moorhead, Minn.

• **Standard Oil Co. (Ind.).**—243 miles, 10-12-in., proposed, Whiting, Ind., to River Rouge, Mich.

Sun Pipe Line Co.—110 miles, 8-in., under way, Fostoria to Hudson, Ohio.

• **Texas Pipe Line Co.** (Evangeline Products Systems)—196 miles, 16-in., under way,


"Lining up a road section of 30" pipe line"
HOUSTON CONTRACTING COMPANY
General Contractors
OIL • GAS • GASOLINE • WATER PIPE LINES
LAURENCE H. FAVROT R. P. GREGORY GEO. A. PETERKIN
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- Crose Endless Pipe Belt Slings
- Crose Pipeline Cradles
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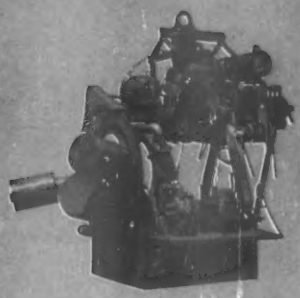
CROSE
CLEANING & PRIMING MACHINE

Line traveling, rugged and dependable, equipped with dual multi-speed transmissions providing greater flexibility of control. Interchangeable cleaning and priming assemblies permit each model to process a wide range of pipe sizes. Model M handles 3"-14" pipe, Model K handles 16"-26" pipe, Model R handles 30"-31" pipe.



CROSE
COATING & WRAPPING MACHINE

Spray ring assures positive and uniform coating of pipe, coats high welds, wrinkle bends and egged pipe. Built-in strainer prevents foreign particles from getting to pipe surface. Precision-built paper brakes are adjustable to permit perfect tension of wrapper. Available for all sizes of pipe.

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PIPELINE KETTLES

No other kettle can offer so many features . . . fully insulated, perfect circulation of heat. Uniform heating of entire inside tank surface, eliminating hot spots. Agitator is hydraulically operated to keep all filler in suspension with a reciprocating motion. Prevents coking. Unit skid mounted or on Athey tracks. Available in 10, 23, or 30 barrel capacities.

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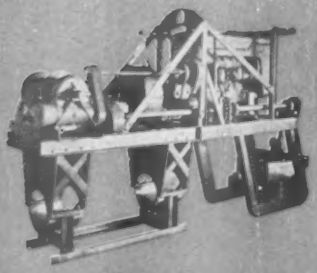
AUGER TYPE
ROAD BORING MACHINE

The fastest and most economical method of boring crossings where rock is not encountered. Installs casing as boring progresses—eliminates cave-ins. Absolutely prevents settling of concrete slab highways or railroad beds. Extremely accurate in alignment. Adaptable to all sizes of casing from 3" to 34".



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Manufacturing Company, Inc.

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BRANCH OFFICES IN HOUSTON, SAN FRANCISCO • EXPORT OFFICE, NEW YORK CITY

Port Arthur, Tex., to Baton Rouge, La. Panama-Williams Co. Completion date 7-53.

Texas Pipe Line Co.—29 miles, under way, Fuller Ranch gasoline plant to Basin Pipe Line System, West Texas. Holder Const. Co.

• **United States Pipe Line Co.**—1,799 miles, 22-26-in., proposed, Beaumont, Tex., to Newark, N. J.
Beaumont, Tex., to Memphis, Tenn.
Memphis, Tenn., to Louisville, Ky.
Louisville, Ky., to Newark, N. J.
Laterals to Paducah and Lexington, Ky.

• **Wolverine Pipe Line System**—200 miles, 14-in., planned, Chicago to Toledo and Detroit. (Joint ownership of Shell, Texas, and Cities Service). Completion date 1-54.

Natural-Gas Pipe Lines

• **Allied Gas Co.**—24 miles, 6⅝-in., proposed, McLean to Champaign County, Illinois.

• **Arkansas-Missouri Power Co.**—140 miles, 2 to 10-in., planned, St. Francis River, Clay County, Arkansas, to near Campbell, Mo.

• **Associated Natural Gas Co.**—88 miles, Missouri.

• **Carolina Natural Gas Corp.**—185 miles, 2-12-in., proposed, lateral lines off Transcontinental in North and South Carolina.

• **Chattahoochee Natural Gas Co.**—70 miles, proposed, Floyd County, Georgia, to Dalton, Ga.

• **Chicago District Pipe Line Co.**—35 miles, 24-30-in., proposed, Chicago area.

Cities Service Gas Co.—21 miles, 26-in., planned, Franklin and Anderson counties, Kansas.
15 miles, 20-in., Craig County, Oklahoma, to Lawrence County, Missouri.

• **Coast Counties Gas & Electric Co.**—40 miles, 3, 4, and 8-in., planned. Coast and Valley region, California.

Colorado Interstate Gas Co.—250 miles, 20-in., under way, Kit Carson, Colo., to Amarillo, Tex. R. H. Fulton & Co., contractor.
Pueblo County to Fowler, Colo.

• **Cumberland and Allegheny Gas Co.**—31 miles, 12-in., proposed, Garrett County, Md., to Keyser, W. Va.

• **East Tennessee Natural Gas Co.**—158 miles, 16-in., planned, Knoxville to Kingsport, Tenn. (58 miles of laterals.) 11-53.

• **El Paso Natural Gas Co.**—1,778 miles, proposed, Permian basin, New Mexico, Texas, and Colorado.

• **Glacier Gas Co.**—285 miles, 20-in., proposed, Kalispell, Mont., to Spokane, Wash.
120 miles, 16-in., proposed, Spokane to Hanford, Wash.
91 miles, 8⅝-in., proposed, Spokane to Lewiston, Idaho.
130 miles, 12¾-in., proposed, Spokane to International boundary at Trail, British Columbia.

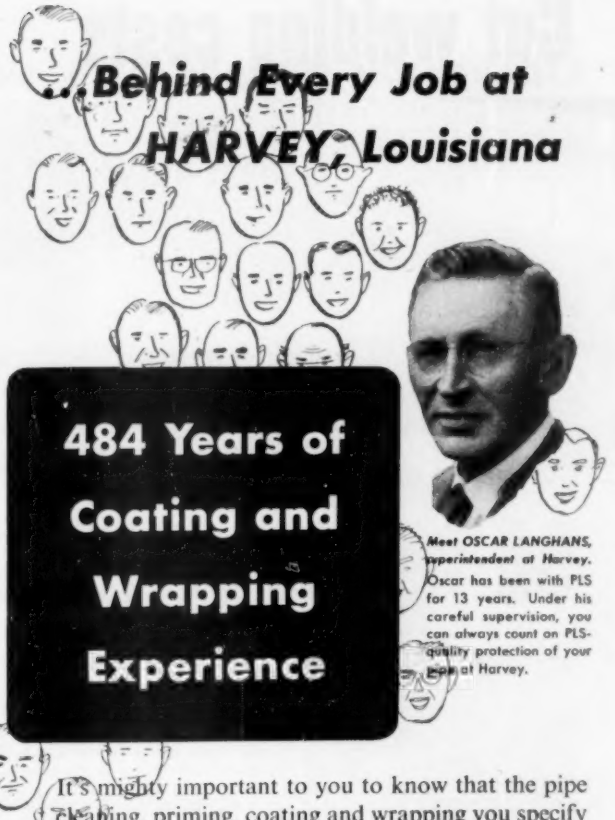
• **Gulf Interstate Gas Co.**—860 miles, 30-in., proposed, Acadia Parish, La., to Boyd County, Ky.
329 miles, 12 to 24-in., proposed. Laterals off Acadia Parish, Louisiana, to Boyd County, Kentucky, line.

• **Home Gas Co.**—32 miles, 12-in., planned, Breesport to Union Center, N. Y.
17 miles, 12-in., proposed, loops from Hansock to Sanford, N. M.
46 miles, 12-in., under way, Tioga and Broome counties, New York. H. L. Gentry Const.
22 miles, 12-16-in., under way, Binghampton, N. Y.

• **Hope Natural Gas Co.**—33 miles, 8-10-12-in., planned, Wyoming County, West Virginia, south to Buchanan County, Virginia.

• **Interstate Power Co.**—26 miles, 8-in., proposed, from Nat. Gas P. L. Co. America line near Hooppole, Ill., to Clinton, Ia.

Iowa-Illinois Gas & Electric Co.—41 miles,



Meet OSCAR LANGHANS, superintendent at Harvey. Oscar has been with PLS for 13 years. Under his careful supervision, you can always count on PLS-quality protection of your pipe at Harvey.

It's mighty important to you to know that the pipe cleaning, priming, coating and wrapping you specify is handled only by men thoroughly experienced in every phase of the job.

At PLS-Harvey, the combined experience of the men responsible for the protection of your pipe totals 484 years. As in all other PLS plants, this experience is supported by the most modern facilities.

You couldn't ask for better assurance that you are getting the most for your pipe protection dollar.

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Pioneers in Steel Pipe Protection

General Office and Plant: Franklin Park, Illinois

Plants at Glenwillard, Penna.; Longview, Texas; Corpus Christi, Texas; Harvey, La.; Sparrows Point, Md.

Dependable Service Since 1931

Cut welding costs

...with "Southern's"

50-ft. pipe sections

The two illustrations above show one of Southern's pipe mills in operation. Note steel coil being fed into mill in top photo.

FOR EXAMPLE: The use of "Southern" 50 ft. pipe sections, instead of shorter lengths, saves up to 40% in field welds. These savings add up to big cost reductions. As a result, lower and more profitable bids can be submitted . . . overall pipeline installation costs can be cut.

"Southern" pipe offers many other economies. Light weight steel pipe means lower freight costs. Automatic production means lower original costs. Exact tolerances mean easier installation of valves and fittings.

Complete range of sizes for all gathering lines

"Southern's" four big mills have a capacity of many miles of pipe per day! Diameters range from 4" through 14½". All pipe conforms with A.S.-T.M. Specification A-139 and can be supplied bare or with Asphalt, Coal Tar, Cement Mortar or other protective coating, as specified.

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Southern Pipe & Casing Co.

Arrow Highway and Irwindale Avenue • Azusa, California

10-in., planned, Washington County to Cedar Rapids, Iowa.

• **Kansas-Nebraska Natural Gas Co., Inc.**—179 miles, planned, Kansas and Nebraska.

54 miles, 4-6-in., planned, Neligh to Hartington, Neb. Completion date 1953.

42 miles, 4-6-in., planned, Neligh to O'Neil, Neb. 9-53.

196 miles, proposed, Kansas and Nebraska.

Kansas Nebraska Natural Gas Co.—70 miles, 6-8-in., under way, Nebraska City to Denver-Julesburg basin, Colo.

• **Lone Star Gas Co.**—100 miles, proposed, storage fields to the Dallas-Fort Worth area.

35 miles, 12-in., proposed, southeastern Schleicher County.

• **Manufacturers Gas Light & Heat Co.**—40 miles, proposed, Allegheny, Washington, and Beaver counties, Pennsylvania.

213 miles, 3 to 26-in., proposed, various points on system in Pennsylvania, West Virginia, and Ohio.

• **Michigan Gas Storage Co.**—30 miles, 26-in., planned, Lainsburg Junction north. 7-53.

• **Midsouth Gas Co.**—191 miles, planned, Helena to Palestine, Ark.

• **Mississippi River Fuel Corp.**—109 miles, 10-18-in., planned, laterals in Woodlawn and Waskom gas fields, Texas.

Missouri Central Gas Co.—25 miles, 6-in., contracted, Moberly to Macon, Mo. L. R. Young Const. Co.

• **Missouri Public Service Co.**—136 miles, 8-10-in., proposed, New Franklin to Trenton, Mo.

• **Montana Power Co.**—52 miles, 16-in., planned, Canada - Montana border to Cut Bank, Mont.

• **Morganfield Natural Gas Co.**—31 miles, 4-6-in., planned, through Sturgis, Providence, Clay, Diamond, Wheatcroft, and Sullivan, Ky.

• **Natural Gas Producers Inc.**—100 miles, 12-in., planned, Yenter pool to Denver, Colo.

• **Nevada Natural Gas Pipe Line Co.**—114 miles, 12¾-in., proposed, Topock, Ariz., to Las Vegas, Nev.

• **New River Gas Co.**—50 miles, planned, Summers to Monroe counties, West Virginia, to Narrows and Dublin, W. Va.

• **New York State Electric and Gas Co.**—59 miles, 8-10-24-in., proposed, Oneonta and Norwich to DeRuyter, N. Y.

New York State Natural Gas Corp.—104 miles, 14, 16, 20-in., under way, looping on Westmoreland, Armstrong, and Tioga counties, Pennsylvania. (Includes 17 miles, 16-in., in Potter County, Pennsylvania, and 21 miles 14-in., replacement in Line No. 507, New York.)

Colesburg Junction to Sabinsville, Pa. (begin at completion of Angelica job), Williams-Austin. Howard Bauer, superintendent.

21 miles, Columbiana and Stark counties, Ohio.

• **New York State Natural Gas Co.**—75 miles, 20-in., proposed, Cameron County to Armstrong County, Pennsylvania.

58 miles, 14 and 20-in., planned, New York State line.

Sabinsville to Boom station.

Shaneateles to Onondaga, N. Y.

Ithaca to Dryden, N. Y.

Niagara Mohawk Power Corp.—55 miles, 10-in., begin 4-1-53, Watertown to Syracuse, New York. Williams-Austin Co.

• **Northern Indiana Fuel & Light Co.**—33 miles, 8-in., proposed, Edgerton to Auburn, Ind.

• **Northern Natural Gas Co.**—580 miles, proposed, Kansas, Texas, Oklahoma, and Nebraska loops.

210 miles, 26-in., planned, five loops in Texas-Oklahoma area, two in Kansas, and two in Nebraska.

400 miles, 24-in., proposed, Emerson, Manitoba south to Red River Valley through Fergus Falls on to St. Paul, Minn.

102 miles, planned, extension.

Northern Natural Gas Co.—140 miles, 4-6-8-in., under way, south of Rolla, Kans., to Guymon, Okla. Reese Bros. Const. Co. E. H. Reese, spreadman at Hugoton, Kans.

• **Northwest Natural Gas Co.**—750 miles, planned, Washington, Oregon, and Idaho.

24-in., Eastport, Idaho, to Monroe, Wash.

18-in., Monroe to International boundary near Lynden, Wash.

22-in., Monroe to near Seattle, Wash.

20-in., Seattle to Portland, Ore.

• **Ohio Fuel Gas Co.**—31 miles, 20-in., planned, Licking County to Richland County, Ohio.

22 miles, 16-in., planned, Dayton, Troy, Piqua, and Sidney, Ohio.

23 miles, 16-20-in., planned, Wellington to Elyria, Ohio; 16 miles, 20-in., planned, Benton Station to Crawford Station; 18 miles, 20-in., Crawford Station to near Columbus; 16 miles, 16-in., planned, Berlin to Sandusky, Ohio.

74 miles, 3 to 20-in., planned, Hocking, Knox, and Ashland counties, Ohio.

47 miles, 20-in., planned, Benton Township, Hocking County, to Columbus, Ohio.

61 miles, planned, northern and southwestern Ohio.

33 miles, 20-in., proposed, Jefferson to Seneca, Ohio.

Oklahoma Natural Gas Co.—50 miles, 10-in., under way, Sapulpa to Chouteau, Okla. A. O. Smith. 6-53.

• **Pacific Gas & Electric Co.**—50 miles, 12-16-20-in., planned, Fresno to Merced, Calif.

(Section 1) 16-in., Burrel to near Easton, Calif.

(Section 2) 20-in., Holm to Topock-Milpitas line.

(Section 3) 12-in., parallel existing Madera-Livingston line, planned, Monterey to Fort Ord to Castroville; Napa Wye to Shellville; Cotati to Santa Rosa, Calif.

170 miles, 34-in., proposed, main-line loops along Topock, Ariz., to Milpitas, Calif.

Pacific Gas & Electric Co.—141 miles, 34-in., under way, parallel sections along Topock-Milpitas line. Engineers Pipe Line, Ltd. Summer 1953.

• **Pacific Northwest Pipeline Corp.**—1,466 miles, proposed, Ignacio, Colo., to Bellingham, Wash.

380 miles, proposed, laterals and spurs off main line to Pocatello, Idaho, to Yakima, Wash.

Panhandle Eastern Pipe Line Co.—70 miles, 24-26-in., under way, looping from Sneed, Tex., to Emporia, Kans.

174 miles, 30 and 26-in., contracted. Tuscola, Ill., eastward—looping present system; R. A. Conyes, contractor.

26-in., Edgerton, Mich., Anderson Brothers

30-in., looping in Tuscola, Ill.

30-in., looping in Montezuma, Ind.

30-in., looping in Zionsville, Ind.

• **Panhandle Eastern Pipe Line Co.**—23 miles, planned, Peoria County, Illinois.

• **Peoples Natural Gas Co.**—25 miles 6 to 24-in., planned, Cambria and Blair counties, Pennsylvania.

• **Permian Basin Pipeline Co. (Northern Natural)**—163 miles, 20-30-in., proposed, Permian basin and eastern New Mexico.

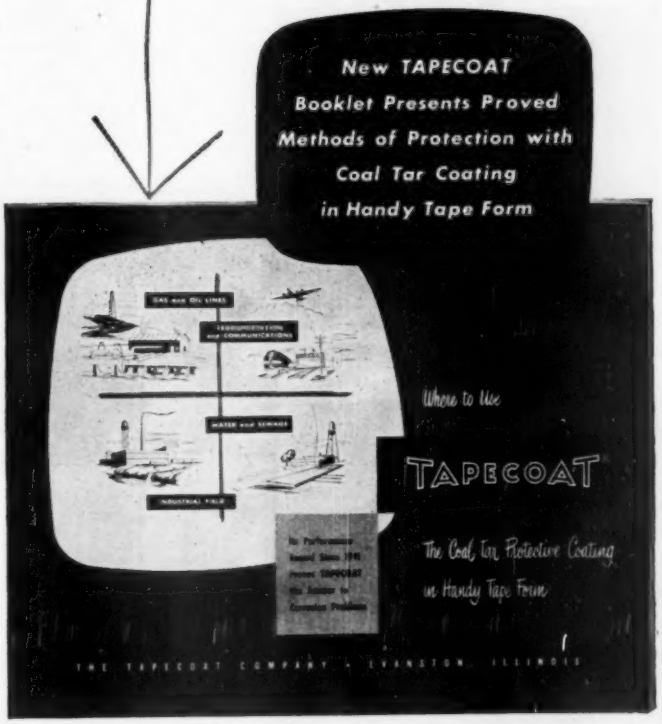
• **Phillips Petroleum Co.**—125 miles, 2 to 24-in., planned, Midland, Upton, Glasscock, and Reagan counties, Texas. Completion date 6-53:

28 miles, 10-in., planned, Bayou Plant to Adams Terminal. Completion date 7-53.

• **Public Service Co. of Colorado**—95 miles, proposed, Douglas Creek and other gas fields to Grand Junction, Colo., area.

• **Public Service Co. of North Carolina**—83 miles, 8-in., planned, Kings Mountain

HOW TO PROTECT VULNERABLE SURFACES AGAINST CORROSION



Wherever you have a corrosion problem, you will find this guide helpful in working out an economical and practical solution.

Based on the experience and research of TAPECOAT engineers since 1941, this factual booklet shows where and how TAPECOAT coal tar coating in handy tape form can be used to overcome corrosive action—both underground and above ground. It presents proved methods of protecting pipe, pipe joints, fittings, couplings, tanks and other vulnerable surfaces, together with case histories demonstrating the ability of TAPECOAT to meet the most severe conditions.

Write for your copy of this helpful guide today.

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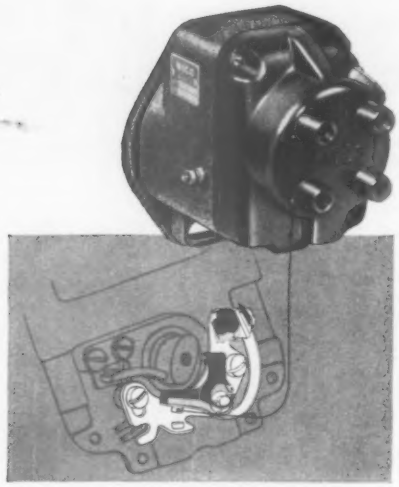

WICO Magneto contacts are built to last longer

- Take a close look at the contact assembly in a Wico Magneto—and you'll see how it's built for long, extra-dependable service.
- See that breaker arm? It's made of strong, high-quality linen-reinforced plastic that won't warp under heat, cold or humidity.
- And that stainless steel spring? It never corrodes . . . takes millions of bends without breaking. It conducts current without need for foil strips that other magnetos use.
- The contact bracket is protected by a nickel plated finish that won't corrode or flake off. And those heavy-duty contacts are made of pure, long-wearing tungsten.

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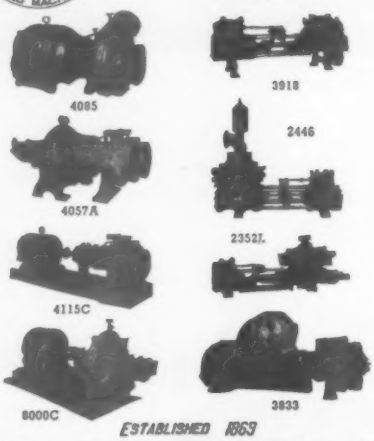
BUILDERS OF OUTSTANDING PUMPS
Since 1869



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to Asheville, N. C. Completion date 3-1-53.

• **Rockland Light & Power Co.**—22 miles, 8-in., proposed, Orangetown to Tompkins Cove, N. Y.

• **Shenandoah Gas Co.**—39 miles, 3-4-8-in., proposed, Middleton, Va., to Martinsburg, W. Va.

• **South Carolina Natural Gas Co.**—160 miles, 16-12-10-in., proposed, Aiken, S. C., to cities of Columbia, Summerville, and Charleston, S. C.

• **South Georgia Natural Gas Co.**—339 miles, 2-12-in., planned, Phoenix, Ala., to Tallahassee, Fla. (a) 12-in., Phoenix, Ala., to Albany, Ga., (b) 10-in., Albany, Ga., to Moultrie, Ga., (c) 8-in., Moultrie, Ga., to Tallahassee.

• **Southern California Gas Co.**—35 miles, planned, Antelope Valley, California.

Southern California Gas Co. and Southern Counties Gas Co. of California—45 miles, 30-in., contracted, looping on line from Arizona border to Los Angeles. J. B. Gill.

81 miles, 30-in., contracted, Whitewater to Desert Center, Calif. J. B. Gill.

Contracted, looping between Blythe and Colorado River and on westward of Indio. J. B. Gill.

• **Southern California Gas Co., and Southern Counties Gas Co.**—73 miles, 30-in., planned, loops on main line from Blythe to Los Angeles.

Southern Natural Gas Co.—1,235 miles, 24 to 4½-in., contracted, Louisiana, Mississippi, Alabama, and Georgia, and South Carolina. Houston Contracting and H. C. Price. Fall 1953.

Gwinville, Miss., to Franklinton Junction, La.

Lateral from Franklinton Junction, La., to Sand Hook field, Mississippi.

Franklinton Junction, La., to Duck Lake gas field, Louisiana.

Duck Lake gas field, Louisiana, to Lake Sand field, Louisiana.

• **Southern Union Gas Co.**—21 miles, 20-in., planned, Albuquerque, N. M.

30 miles, 12-20-in., contracted, San Juan County, New Mexico. R. H. Fulton & Co.

• **Southwest Gas Corp., Ltd.**—26 miles, proposed, from P.G.& E. line to Victorville, Calif.

• **Tennessee Gas Transmission Co.**—50 miles, 30-in., proposed, Sinton and El Campo, Tex.

574 miles, 30-in., planned, Kinder, La., northeast through Louisiana, Mississippi, to Portland, Tenn.

130 miles, loops in Texas, Louisiana, Ohio, and Pennsylvania.

45 miles, 20-in., loops, Buffalo to U. S.-Canadian border near St. Catharines.

158 miles in Louisiana and Texas.

Texas Eastern Transmission Corp.—315 miles, 24-in., under way, Provident City, Tex., to Castor, La. Brown & Root, Inc.

Provident City to Waller, Tex. Associated Pipe Line Contr., Inc.

Waller to Corrigan, Tex. Anderson Bros.

Corrigan to Center, Tex. Williams Bros.

Center, Tex., to Castor, La. Trojan Const. Co., Inc.

• **Texas-Ohio Gas Co.**—1,435 miles, 30-in., proposed, Hidalgo County, Texas, through Arkansas, Mississippi, Tennessee, and Kentucky on to Spencer, W. Va. Completion date 6-30-53.

• **Trans-Northwest Gas, Inc.**—246 miles, proposed, International Boundary near Osoyoos, B. C., to Washington and Idaho.

275 miles, branch lines.

• **Union Oil Co. of California**—40 miles, 8-10-in., planned, San Joaquin Valley and Los Angeles Basin.

• **United Fuel Gas Co.**—50 miles, 20-24-in., proposed, Wood County to Lanham, W. Va.

• **United Gas Pipe Line Co.**—44 miles, 20-in., planned, Lirette field to Harvey, La.

• **United Natural Gas Co.**—50 miles, 12-in., planned, Elk County to Jefferson County, Pennsylvania.

• **Utah Natural Gas Co.**—96 miles, 16-18-in., proposed, Clear Creek field near Price to Salt Lake City, Utah.

18-in., Clear Creek to Provo, Utah.

16-in., Provo to Salt Lake City, Utah.

Virginia Natural Gas Co.—153 miles, Buckingham to Richmond and Portsmouth, Va.

Warren Petroleum Corp.—78 miles, 2-24-in., proposed, Lovington, N. M. Completion date 9-53.

Westcoast Transmission Co., Ltd.—(See foreign natural gas pipe lines).

Western Slope Gas Co.—26 miles, 10-8-in., under way, Grand Junction to Garmesa, Colo. Foutz & Bursum Const. Co. 2-15-53.

Wilcox Trend Pipe Line Co. (Harry Bass Drlg. Co.)—157 miles, 14-16-20-in., under way, gathering system for delivery to proposed Texas Eastern terminal at Provident City, Tex. (60 miles laterals). H. B. Zachry. Completion date 5-53.

Duvall County to Goliad County, Texas. H. B. Zachry. 5-53.

Goliad County to Provident City, Tex. H. B. Zachry. 3-53.

Foreign Crude-Oil Pipe Lines

Arabian American Oil Co.—16 miles, 12-in., under way, loops on Al Kobar, Saudi Arabia to Bahrein Island, submarine lines.

Basrah Petroleum Co.—72 miles, 24-in., under way, Zubair to Fao. Completion date May 1953.

• **Cia. de Petroleo Ganso Azul, Ltd.**—

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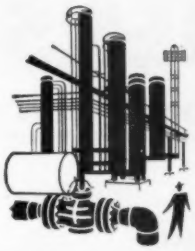
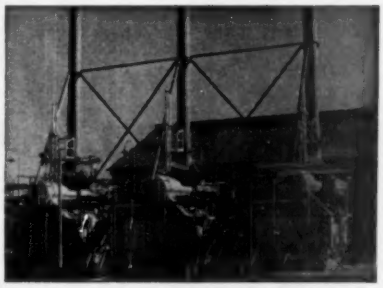
*WICKES steam generators are cutting costs in America's finest refineries and natural gasoline plants





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143

48 miles, 4-in., planned, Ganzo Azul field to Pucalpa on upper Ucayali River, Peru.

• **Creole Petroleum Corp.**—25 miles, 34-in., planned, Lagunillas to La Salina (State of Zulia). Completion date April 1953.

Direccion General de Yacimientos Petroliferos Fiscales—409 miles, under way, Plaza Huincul to Bahia Blanca, Argentina.

Interprovincial Pipe Line Co.—135 miles, 24-in., looping from Regina to U. S. border.

• **National Iranian Oil Co.**—38 miles, 12-in., planned, Lali to Masjid-i-Sulaiman.

27 miles, 12-in., planned, Kut-Abdullah to Zergan.

• **Petroleos Mexicanos.**—145 miles, 12-in., considered, 18 de Marzo field via Reynosa to Monterrey, Mexico.

100 miles, planned, Isthmus of Tehuantepec, Jose Colomo to El Plan field, Minatitlan.

72 miles, 12-in., proposed, Poza Rica to Atzacapotzalco, Mexico.

Petroleos Mexicanos.—125 miles, 10-in., under way, Jose Colomo to El Plan, Mexico.

• **Saskatoon Pipe Line, Ltd.**—56 miles, 6-in., planned, Milden to Saskatoon, Sask.

Texas Petroleum Co.—60 miles, 4-6-in., under way, Pta. Nino to La Dorada.

• **Trans Mountain Oil Pipe Line Co.**—30 miles, planned, Vancouver, B. C., terminal to Ferndale, Wash.

Trans Mountain Oil Pipeline Co.—711 miles, 24-in., under way, Edmonton, Alta., to Vancouver, B. C. Canadian Bechtel, Ltd., engineers. Completion date 8-53.

Edmonton to Acheson, Canadian Pipe Line Const. 8-53.

Acheson to Blue River, B. C., Comstock Midwestern. 8-53.

Blue River, B. C., to Coquehalla, B. C., Mannix, Ltd. 8-53.

Coquehalla to Vancouver, B. C., Comstock Midwestern. 8-53.

• **Yacimientos Petroliferos Fiscales Bolivianos.**—170 miles, 4-in., planned, Bermejo to Tupiza, Bolivia.

Foreign Products Pipe Lines

Colombian Ministry of Petroleum.—115 miles, 4-in., begin 1953, La Dorada to Cartago, Colombia, Williams Bros. Engineers.

93 miles, 8-in., begin 1953, Cantimplora to Dorada, Colombia, William Bros. Constructors.

• **Empresa Nacional del Petroleo**—80 miles, 6⅝-in., planned, Concon to Santiago, Chile.

Empresa de Ferrocarriles Ecuatorianos.—50 miles, 6-in., contracted, Guayaquil to Palmira, Ecuador. J. A. Jones, contractor; C.R.C. Engineering Co., engineers.

• **Governments of Southern Rhodesia and Portuguese East Africa.**—200 miles, considered, Beria, Portuguese Mozambique to Umtalia, Southern Rhodesia.

• **Petroleos Mexicanos.**—124 miles, 6-in., planned, Lagos to Guadalajara, Mexico.

54 miles, 6-in., planned, Lagos to Aguascalientes, Mexico.

82 miles, 8-in., planned, Salamanca to Lagos, Mexico.

• **Shell Co. of Australia.**—58 miles, 8-in., planned, Geelong, Melbourne to Newport, Australia.

• **Sun Pipe Line Co. of Canada.**—200 miles, 8-in., planned, Sarnia, Hamilton, Toronto, Ont.

• **United States Government.**—375 miles, 12-in., planned, St. Nazaire to Melun and Metz, France.

Foreign Natural-Gas Pipe Lines

• **Azienda Generale Italiana Petroli.**—110 miles, 12-14-16-in., Start 11-52. Cortemaggiore to Genoa. Completion date 11-53.

Azienda Generale Italiana Petroli—90 miles, 12-in., under way, Cortemaggiore to Bologna, Italy, SNAM crews.

120 miles, 16-in., under way, Cremona Porto Mar to Ghera, Italy, Montubi, contractor.

40 miles, 12-in., under way, Ripalta-Bergamo, Italy.

Direccion General del Gas del Estado—310 miles, 8-in., under way, Plaza Huincul to Neuquen, Argentina, to the vicinity of General Conesa, Argentina.

• **Empresa Nacional del Petroleo**—80 miles, 10¾-in., planned, Concon to Santiago, Chile.

• **Northwest Natural Gas Co.**—950 miles, 24-in., planned, Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.

Petroleos Mexicanos.—205 miles, 16-in., under way, Monterrey to Torreon, Mexico.

• **Petroleos Mexicanos.**—440 miles, 20-in., planned, Brazil to Tampico to Poza Rica, Mexico.

• **Trans-Canada Pipe Lines, Ltd. (Canadian Delhi Oil Co.)**—2,247 miles, 14 to 30-in., proposed, Alberta to Toronto to Montreal.

747 miles, 8 to 24-in., gathering system in Alberta.

• **Westcoast Transmission Co., Ltd.**—1,110 miles, 24-in., planned, Dawson Creek, B. C., through Pine Pass and Fraser River Valley to Kamloops, Princeton, and Vancouver to Portland. Ford, Bacon & Davis, engineers.

280 miles, 20-in., planned, Pincher Creek

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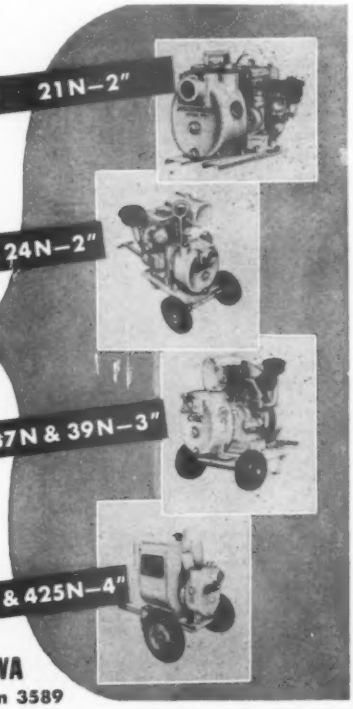

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to Montana on to Spokane, Wash. Ford, Bacon & Davis, engineers.

138 miles, 20-in., planned, Sumas to Tacoma, Wash.

139 miles, 18-in., planned, Tacoma, Wash., to Portland, Ore.

• **Western Pipe Lines.**—833 miles, 24-in., proposed, from southern Alberta, eastward across the Canadian prairies, serving principal towns and cities along the route to a point near the International boundary.

Skelly Buys Gathering Line

TULSA.—A 55-mile gathering system which Sohio Petroleum Co. has operated in Barber and Kingman counties, western Kansas, has been sold to Skelly Oil Co.

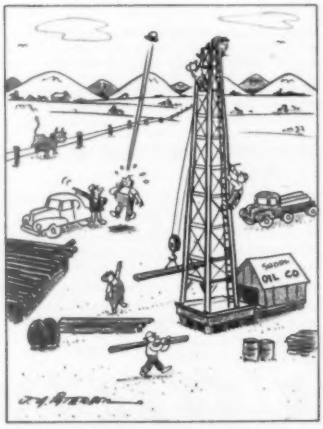
The line which has been serving scattered small oil areas, is currently running about 1,500 bbl. of crude daily and tendering it to Skelly's Cunningham pipe-line station.

Skelly will formally take over the properties on March 1. Amount of the sale was not disclosed.

Transco Hearing Under Way

WASHINGTON.—A Federal Power Commission hearing started here on a petition by Transcontinental Gas Pipe Line Corp., Houston, to amend the FPC's January 1951 order which authorized the company to build an extension of its main pipe line to provide an auxiliary connection for delivery of natural gas to the New York metropolitan area.

Transcontinental's petition requests the FPC to remove restrictions placed upon the operation of the so-called "Narrows Crossing" by the 1951 order, which limited operation of the facilities to the rendering of emergency service to the company's customers in the New York area.



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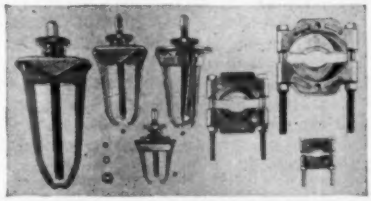

CG-608 Industrial Puller Set—includes 4 screw-type pullers—small, medium (2-jaw and 3-jaw) and large. Size capacity up to 14", power to 20 tons. 3 Bearing Separators, up to 5¾" O.D. capacity, and Screw Point Protection Set.

CG-270H 8½" Jaw Capacity 2-Jaw, Slide Hammer Gear Puller

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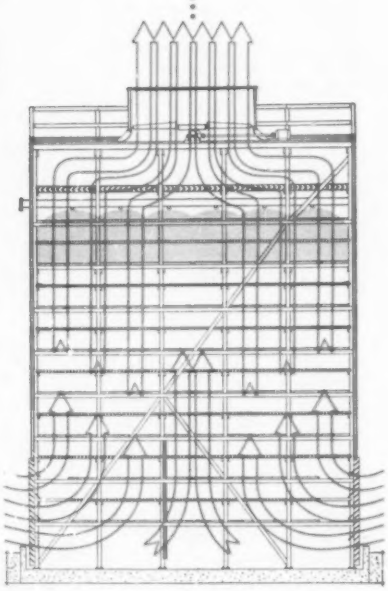
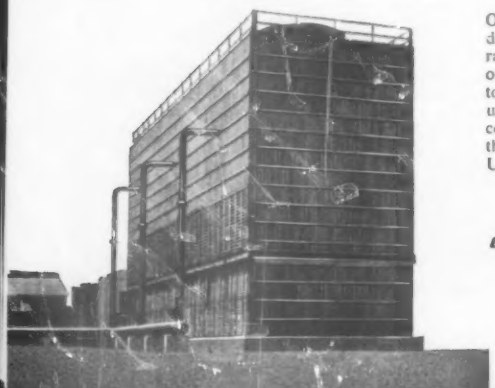
Heavy stainless steel fan blades are finely balanced, resist corrosion and are mounted on shafts whose exceptionally high fatigue strength has been substantiated by strain gauge tests and actual use. Pitch is adjustable to efficiently handle required air volumes at minimum tip speeds and horsepower requirements – more air per kilowatt. Speed reducers incorporating spiral bevel gears feature oil-bath lubrication and dry-air breather. The low-speed fan shaft is mounted on special steep angle thrust with radial bearings to take the combined gear thrust, fan thrust and weight of fan assembly. Driving mechanisms are built for hard-wearing, maintenance-free performance and for smooth, quiet operation.

Vibration Cut-out switches, exclusive with Fluor Cooling Towers, are an emergency safety device that stops the motor should excessive vibration accidentally occur, preventing possible damage to the tower or mechanical equipment. Design employing internal gusset plates duplicates that used in wooden bridge construction. These connectors add greater tensile and compressive strength to structural members, lower the total weight of towers, require less erection time and materially increase tower life. Sloping grid decks of rough-finished redwood with minimum one-inch dimension are used as scaffolding during erection and provide maximum deck surface with negligible air pressure drop through the tower.



Air distribution is controlled at every stage of its travel through the tower. Louver height is designed to obtain the desired intake velocity and wind-deflectors inside the tower uniformly direct air currents to all areas. Approach to the desired wet-bulb temperature is easily accomplished and performance to customer's specifications is guaranteed in every case.



Only Fluor Counterflo Cooling Towers are completely prefabricated. All cutting, drilling, and nailing is performed at the factory and tower parts are "packaged" for rapid delivery, marked for orderly assembly. More efficient control of the quality of straight-grained heart of California redwood and excellent workmanship in Fluor towers are maintained through prefabrication. Inexperienced craftsmen and laborers under Fluor's supervision can erect a Fluor tower in a minimum of time and at considerable savings in erection costs. Prefabrication means standardization; parts that may become worn or damaged over the years may be replaced economically. Uniformity of appearance as well as performance is assured.

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REFINING

P. C. Spencer to Address NPA Meeting in Cleveland

NEW YORK.—P. C. Spencer, president of Sinclair Oil Corp., will be a featured speaker at the fiftieth semiannual meeting of the National Petroleum Association in Cleveland April 15-17. He will speak on transportation at the general session.

Oliver S. Ambrose of Tide Water Associated Oil Co. will discuss the economics of lubricating oils at the meeting of the association's board of trustees.

Group sessions will be held on industrial relations and traffic and transportation, and the departments of standards and tests and manufacture will hold a joint session.

A.P.I. Lube Group Reviews Progress in Crankcase Oil

DETROIT. — Present automobiles deliver 80 per cent more power per cubic inch of displacement than they did 25 years ago. This is due to progress on three fronts: Engine design, improved fuels, and better lubricants, Earl Bartholomew, of Ethyl Corp., said here at a meeting of the A.P.I. lubrication committee.

He outlined lube-oil developments of the past quarter century, stressing the interdependence of fuels, lubricants, and engines in technical progress.

The average compression ratio of 1952 model passenger cars was 7.18/1 as compared with 4.88/1 in 1928. Over the same period average horsepower has increased from 71.3 to 122.1, while average displacement has remained essentially the same.

Following a review of the many complex problems which attended these improvements in engine design and in fuel and lubricant properties, he concluded that present engine oils will be further improved to meet the more severe conditions expected in the future.

Pilot Plants, Waste Disposal Subjects for A.C.S.

LOS ANGELES.—Members of the Petroleum Chemistry Division of the American Chemical Society meeting here March 15-19 will hear 61 papers on a variety of subjects. In addition to a general session, the division is sponsoring a symposium on the literature of chemicals derived from petroleum, a panel discussion on pilot plants, and a symposium on industrial waste-disposal problems of the petroleum industry.

Charlotte Schaler of Sinclair Refining Co., New York, is chairman of the literature sessions and Dr. C. L. Brown of Standard Oil Development Co., Linden, N. J., will head the panel on pilot plant design and operation. The group, presenting 16 papers on all phases of refinery and oil field waste disposal is headed by R. N. Giles of Standard Oil Co. (Ind.), Chicago, who represents the A.C.S. Division of Water, Sewage, and Sanitation Chemistry, and R. F. Weston of Atlantic Refining Co., Philadelphia.

At a Chicago meeting to be held September 6-11 two symposiums are planned. One will deal with petrochemicals in the postwar years, with

NELSON REFINERY CONSTRUCTION INDEX

Appears in the first issue each month.

Explanation—"News Items that Appear in Quarterly Cost Indexes," July 7, 1952, pages 105 and 106.

Compiled by W. L. Nelson—Petroleum Refinery Consultant—Tulsa.

Indexes of Individual Equipment Items—January, April, July and October.

INDEX (1946 = 100)

	1948	1949	1950	1951	Nov. 1952
Pumps, compressors, etc.	127.0	135.9	138.2	155.9	155.6
Electrical machinery	127.6	130.9	134.9	154.3	150.8
Internal combustion engines	116.9	124.8	126.0	146.1	146.0
Instruments	120.0	122.0	127.8	142.3	148.1
Heat exchangers	130.0	133.0	140.0	152.0	169.4
Miscellaneous equipment average	*122.1	*121.6	*126.2	*145.1	154.0
Materials component	139.3	143.6	149.5	164.0	166.9
Labor component	128.0	137.1	144.0	152.5	169.5
Refinery construction index	132.5	139.7	146.2	157.2	168.5

*Used in computing the Nelson Index until April 1952. These are slightly different than the average of the Miscellaneous Equipment Items shown above.

Engineering Manual Compares VALVES

New, revised edition of "Equivalent Valves" manual, now ready, compares valves of 20 manufacturers by material, type, pressure rating, structural variations. Shows sizes for cast steel and forged steel valves for the first time. 50,000 postings in its 170 loose-leaf pages. Rugged, red and black leatherette cover with heavy spring closing rings. Measures 9" x 12" x 3". Weighs 5 lbs. Hundreds in use by major companies everywhere. Like adding an extra man. Price $21.50 domestic, $22.50 export, with annual revision service also available. We send on approval. Order your copy today.

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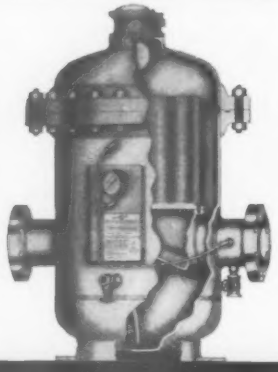

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#750 High Temperature — 400° F. to 900° F.

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DESCO Lubricants are packed in convenient individual sticks in 6 sizes. 12 to 24 sticks to a carton. 6 cartons in a case. Write for catalog and prices.

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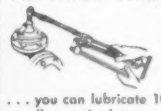

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Dr. Max Neuhaus of Jefferson Chemical Co., New York as chairman. The second is a joint session with the Analytical Division on the subject of mechanization of analytical methods in the petroleum industry. Cochairmen are Dr. Eugene Rosenbaum, Sun Oil Co., Philadelphia, and Dr. G. E. A. Wyld, Shell Development Co., Emeryville, Calif.

Refinery Construction Up

WASHINGTON.—In the cost of new facilities covered by certificates of necessity, petroleum refining ranks fourth among all industries in this country, according to the Office of Defense Mobilization. Total reported cost of new refining facilities so covered came to $1,405,971,000 as of September 30, 1952. This total was exceeded only by proposed investment of the electric light and power, railroad, and steel industries.

Of the total value of refining equipment planned, $515,520,000 worth, or 37 per cent, was in place by September 30, and $607,242,000, or 43 per cent was installed by the end of last year. A total of 346 separate certificates have been issued by Defense Production Administration for expansion and modernization of petroleum refining facilities.

Construction of new refining capacity is moving fast, however, with only $296,000,000 in new projects, 21 per cent of the total, not started by September 30. Nearly all projects are slated for completion by the end of 1954.

New Petrochemical Firm

ST. LOUIS.—Mathieson Chemical Corp. and Mississippi River Fuel Corp. have joined to incorporate a new firm, Mathieson Mississippi Co. The new Delaware corporation was formed to explore the possibilities of developing the synthesis of certain chemicals from natural gas, in the St. Louis area.

Mississippi River Fuel's part in the new company will be to supply the natural-gas components. The company operates a 1,318-mile pipe-line system serving St. Louis and intervening points with gas from the Monroe area of North Louisiana, and plans to lay 109 miles of new line connecting the system to the Waskom and Woodlawn fields of East Texas.

The new petrochemical firm will represent equal investment by both parent companies. Capitalization, which may prove substantial, will await the results of the current studies. Dr. Carl Prutton, vice president of Mathieson, has been elected president of the new company.

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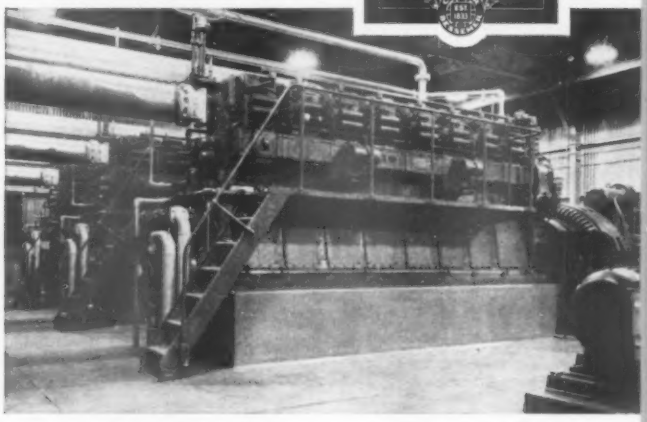
These Cooper-Bessemer turboflow, spark-ignited four cycle gas engines drive 500 K.W. generators to provide electric power for the operation of all pumps, air compressors and similar equipment.

Another Example of Efficient Power at Lower Cost



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NATURAL GAS

A.G.A. Technical Meeting Scheduled April 30-May 1

CHICAGO.—An intensive technical program is planned for the transmission and storage conference of the American Gas Association at the Edgewater Beach Hotel here April 30 and May 1.

Tentative subjects for the first day's sessions include corrosion, compressor stations, gas processing, and the revising of the B31 pressure piping code. Topics to be discussed the following day will include underground-storage operations, gas measurement, dispatching and communications, and pipe-line construction and maintenance.

Also scheduled are talks by A.G.A. President Frank C. Smith and by a representative of a natural-gas-storage company who will describe development and operation of an underground gas-storage field.

T. G. T. Gas Reserves Total 11.7 Trillion Cu. Ft.

HOUSTON.—Tennessee Gas Transmission Co. has under contract more than 11.7 trillion cubic feet of gas for future supply, according to statistics released in its annual report.

During the past year contracted reserves were increased a net 1.5 trillion cubic feet, when an additional 2 trillion cubic feet were lined up, with 455 billion being required to meet 1952 committments. Additional reserves of a substantial nature are in fields connected to the system, but not yet contracted for, the report stated.

A significant 20-year contract has been made with Humble Oil & Refining Co., providing for the purchase of 500 billion cubic feet of gas to be produced from Humble's interest in various fields in Texas, T.G.T. reported. An additional agreement has been made with Humble, extending to August 1, 1962, under which Humble may from time to time request the company to transport up to 500 million cubic feet of gas daily between points within Texas. Upon any such request, T.G.T. has agreed to enter into a 20-year contract for transportation service.

An interesting portion of the report dealt with the increased prices being paid for natural gas, which climbed from 4.61 cents per M.c.f. in 1949 to 6.58 cents in 1952, with the average this year expected to jump to an estimated 9.43 cents per M.c.f. The sharp rise is due to execution of new contracts and renegotiation of old ones providing for payment of uniform prices to producers in the same area, the report stated.

At the end of 1952, T.G.T. had in force a total of 198 gas-purchase contracts with 208 producers covering reserves in 123 fields in Texas and 17 fields in Louisiana. Authorized daily capacity has grown to 1.515 billion cubic feet and present gas supply contracts represent a 20.8 year reserve at this capacity.

El Paso Natural Hearing to Start Before FPC March 19

WASHINGTON.—A hearing on proposals for El Paso Natural Gas Co. to acquire natural-gas pipe-line facilities in Texas from West Texas Gas Co., Lubbock, will get under way before the Federal Power Commission March 19.

The commission also has consolidated for hearing with these applications two earlier proceedings involving Southern Union Gas Co., Dallas, and El Paso. Southern Union wants to increase natural-gas deliveries in the Clovis, N. M., area and El Paso proposes partial abandonment of service to West Texas, which supplies Southern Union.

El Paso plans to purchase from West Texas 361,233 ft. of pipe line between Umbarger, Tex., and the Texas-New Mexico state line; a total of 236,126 ft. of line between Amherst and Farwell, Tex.; and a 600-hp. compressor station. These facilities are now used by West Texas to supply Southern Union with gas received from El Paso.

West Texas has applied for authority to abandon service to Southern Union, saying sale of the facilities would eliminate it as a "middle man." El Paso would pay approximately $293,400 in the sale.

Columbia System's Gas Sales Reach New High

NEW YORK.—Columbia Gas System, Inc., during 1952 sold approximately 430 billion cubic feet of gas, a gain of four per cent over 1951, George S. Young, president, said last week. About 73 per cent of the gas was purchased from southwest pipeline companies.

Columbia's Appalachian gas reserves gained slightly in 1952. During 1952, proven and unproven reserves totaled 3,378 billion cubic feet. In 1951, proven reserves were 2,264 billion cubic feet and unproven reserves were 880 billion cubic feet or a total of 3,144 billion cubic feet.

Gas acreage (including acreage in which both oil and gas rights are retained) held by Columbia totaled 4,395,432 acres on January 1, 1953. This comprises 1,529,422 acres in operation, the balance of 2,866,010 acres are held in reserve.

The total quantity of gas in Columbia's underground storage was approximately 220 billion cubic feet on November 1, 1952, a new record for this system.

One of the pioneers is underground natural-gas storage, Columbia has 36 storage pools located throughout its market area. These pools underlie a total of 274,000 acres having an ultimate capacity of 267 billion cubic feet. The total investment in facilities devoted entirely to storage is $60,000,000.

Peak-day requirements for the 1952-1953 winter season are estimated by Columbia at 3,328 billion cubic feet, of which 1,596 billion cubic feet would be obtained from these underground storage pools.

Sulfur - Extraction Plant To Be Completed April 1

CASPER, Wyo.—Completion date for Seaboard Oil Co.'s Silver Tip sulfur-extraction plant in Park County, Wyoming, has been set for April 1.

The plant will handle up to 4,000,000 cu. ft. of gas daily from wells in the region. It also is expected to extract a maximum of 50 tons of commercial sulfur per day. The cost will be $1,500,000.

Natural Gasoline

Pegasus Plant Construction Being Rushed by Magnolia

MIDLAND, Tex.—Construction is being rushed on Magnolia Petroleum Co.'s Pegasus gasoline plant 32 miles southwest of here. As soon as every unit is in operation the plant will be able to process 60,000,000 cu. ft. of gas per day.

The partly finished plant has been taking 30,000,000 cu. ft. of gas daily that ordinarily would have been vented. Magnolia engineers expect to produce 105,000 gal. of natural gasoline per day by middle of March.

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PIPE LINES

Appeal Planned

Texas-Ohio Gas Co. plans fight on FPC decision

HOUSTON. — The Federal Power Commission's ruling which denied Texas-Ohio Gas Co. authority to build a $185,000,000 1,406-mile natural-gas pipe line from the Mexican Border to Ohio will be appealed, according to Frank Champion, president of the gas company.

"We have the gas reserves, the financing, the materials, and the market," he said, "and the decision came as a complete surprise. We not only proved availability of gas reserves, but we proved deliverability," he stated.

However, the FPC, in upholding an earlier decision it had made, said that Texas-Ohio on the whole record has not made a showing that it has an adequate supply of gas to warrant the issuance of a certificate. The FPC continued by saying that it was adhering to the view that the evidence on markets does not support a finding that the project is economically feasible.

Affirm November 7 order . . . The commission stated that in affirming a November 7 opinion as its final decision, it was not adopting the findings and conclusions in lieu of tentative decision submitted by Texas-Ohio and Reserve Natural because it found, "and now finds, that Texas-Ohio on the whole record has not made a showing that it has an adequate supply of gas to warrant the issuance of a certificate. . ."

FPC pointed out that four separate hearings sessions have already been accorded Texas-Ohio to permit it to make the showing required by the Natural Gas Act and that no showing was made of the additional evidence to be offered.

"We do not believe it would be in the public interest to grant this request to reopen," the commission said.

Plan appeal . . . Champion, however, said an appeal would be made to either the United States Circuit Court of Appeals in New Orleans or in the District of Columbia under Section 19 of the Natural Gas Act. The State of Ohio, intervening in the case on the side of the company, has already given notice of appeal on the basis of the earlier decision.

Champion said that Ohio's attorney general and utilities commissioner had both said that the most recent hearing which confirmed the decision handed down previously was but a delaying action and they entered their appeal without waiting for this most recent decision.

Kansas - Nebraska Project Gets O.K. from FPC

WASHINGTON.—The Federal Power Commission has affirmed, with modifications, a decision by an FPC examiner allowing Kansas-Nebraska Natural Gas Co., Inc., Phillipsburg, Kans., to construct an estimated $2,576,686 in additional pipe-line facilities.

The improvements in the firm's natural-gas-transmission system in Kansas and Nebraska will increase daily capacity from 182,600,000 to 192,590,000 cu. ft. of gas.

Included in the project will be about 196 miles of pipe line, rearrangements of certain compressors, and town border and metering stations to serve 3 small towns and 16 industrial customers. The communities to be served are Wisner, Pilger, and Stanton, Neb.; the customers include a sugar refinery in Ovid, Colo.; and 15 alfalfa dehydration plants in Nebraska. The decision also authorizes a change in facilities previously approved for service to Doniphan, Neb.

Commissioner Francis L. Hall's decision was modified to include a condition requiring that no new service proposed by the company be rendered until Kansas-Nebraska has initiated all firm service to communities it previously has been authorized to serve.

Hearing to be Set on Bid To Build Offshore Gas Line

WASHINGTON.—Additional hearings have been ordered by the Federal Power Commission on the application of United Gas Pipe Line Co., Shreveport, to construct about 31 miles of natural gas pipe lines from an offshore field in the Gulf of Mexico to the firm's existing system in Terrebonne Parish, Louisiana. A time and place for the hearings will be set by further order.

The commission modified and affirmed a decision filed last November by FPC Presiding Examiner Glen R. Law which denied United's application. Law's decision was without prejudice to the company's right to file a later application if and when it had available natural gas reserves to make the project economically feasible.

In its decision the commission said the examiner's records show United has

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not proved it has sufficient gas reserves to justify construction. It noted, however, that drilling operations in the area covered by the contract have not ceased and that United should be given further opportunity to present evidence.

Service's Bowie Station Nears Final Completion

BOWIE, Tex. — Electrification of Service Pipe Line Co.'s Bowie pump station is scheduled for completion June 1, J. P. Bradley, Bowie district superintendent, said last week.

Service personnel have poured foundations for the new station, a modern installation that will have two 1,000-hp. electric units. The units will replace four diesel engines. The company will raze the old brick station building, a Bowie landmark since 1919.

Electrification of the station is another step in the company's modernization program, launched last summer. Modernization of the station will result in some reduction of the Bowie station crew.

Texas Eastern Moves Into New Shreveport Building

SHREVEPORT.—Texas Eastern Transmission Corp. officially opened its new 14-story office building in downtown Shreveport February 28. Known as the "Texas Eastern Building," the structure is completely air-conditioned, and has about 200,000 sq. ft. of office space, more than half of which is used for general offices by the company. The remainder is leased.

The building houses a modern cafeteria, several stores, and shops.

Plantation Plans Microwave Control, Operation System

ATLANTA.—A microwave control and operation system is planned by Plantation Pipe Line Co. for its products pipe line from Bremen, Ga., to Chattanooga and Knoxville, Tenn.

The company also anticipates improvements which would raise the pipe line's capacity from 221,000 bbl. daily to 331,000 bbl. daily. These improvements will bring the line's total cost to $80,000,000, according to President Charles R. Younts.

Fifty-six different products, including many grades of gasoline, are transported by the system. Owners of Plantation are Standard Oil Co. (N. J.), Standard Oil Co. of Kentucky, and Shell Oil Co.

If the microwave plan is successful it will be applied to the entire line from Baton Rouge, La., to Greensboro, N. C., Younts said.

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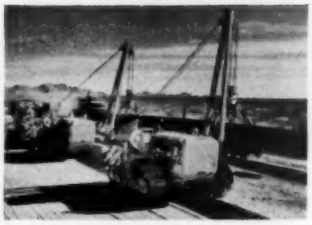

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Among the Drilling Contractors

Safety Panel Discussions Feature Dallas Meeting

Panel discussions on "Safe Handling of Drill Pipe" and "Induction of New Employes" will headline the program of the eighth annual drilling industry safety clinic to be held at Dallas April 9 and 10 under the sponsorship of the safety committee of the American Association of Oilwell Drilling Contractors.

The panel for discussion on "Safe Handling of Drill Pipe" will be composed of one driller from each of six contracting companies, including Kerr-McGee Oil Industries, Inc.; Big Chief Drilling Co.; Carl B. King Drilling Co. of Texas; Henry Black & Sons; Paine Drilling Co.; and Moran Brothers, Inc. E. L. Williams, director, Texas Engineering Extension Service, Texas A. & M. College, College Station, will be moderator.

The panel for discussion of "Induction of New Employes" will be composed of one tool pusher from each of the following companies: Rowan Drilling Co., Inc.; Loffland Brothers Co.; Delta Gulf Drilling Co.; Wheless Drilling Co.; Holmes Drilling Co.; and Makin Drilling Co. M. L. Powers, trade and industrial specialist, University of Oklahoma, Norman, will be moderator.

Featured safety speakers on the program, and their subjects, include: A. E. Chester, vice president and manager of production, Magnolia Petroleum Co., Dallas, "What the Operator Wants in Safety from the Drilling Contractor"; William P. Clements, Jr., general manager and partner, Southeastern Drilling Co., Dallas, "A Drilling Contractor Meets His Safety Problems"; John Ben Sheppard, attorney general of Texas, Austin, "Importance of Safe Operations to the Drilling Industry"; and C. G. Connor, Texas Highway Patrol, Austin, "Highway Safety."

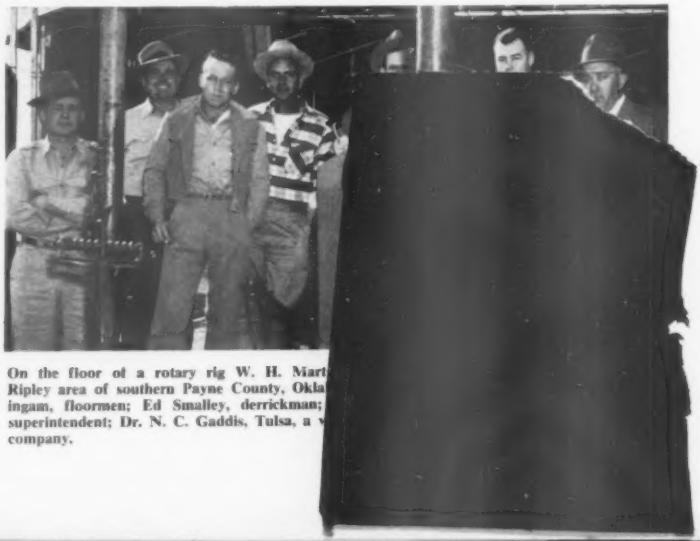
New Mississippi Company

Tallahatchie Drilling Co. is a newly formed drilling contracting company now operating in Mississippi. Incorporators include C. A. Hillman, Paul Googe, H. C. Strider, and E. L. Smith, all of Charleston, Miss.; and J. R. Adams, Jr., Clarksdale, Miss. Headquarters are at Charleston.

New Firm Drills in Texas

Charter has been issued to Texas Drillers, Inc., a newly formed drilling firm, located at Seguin, in Guadalupe County, Texas. Incorporators are Clark D. Core, B. E. Lewis, and W. L. Ray.

Sunnyland Contracting Co., Rayne, La., has two active wildcat operations for Sun Oil Co. in northern Florida. One, projected to 6,000 ft., is 1 Brady-Belcher, located in the C NW NW 18-3n-22w, 5 miles east of Crestview, in the eastern part of Okaloosa County, in the panhandle sector, south of the Alabama line. The other, con-



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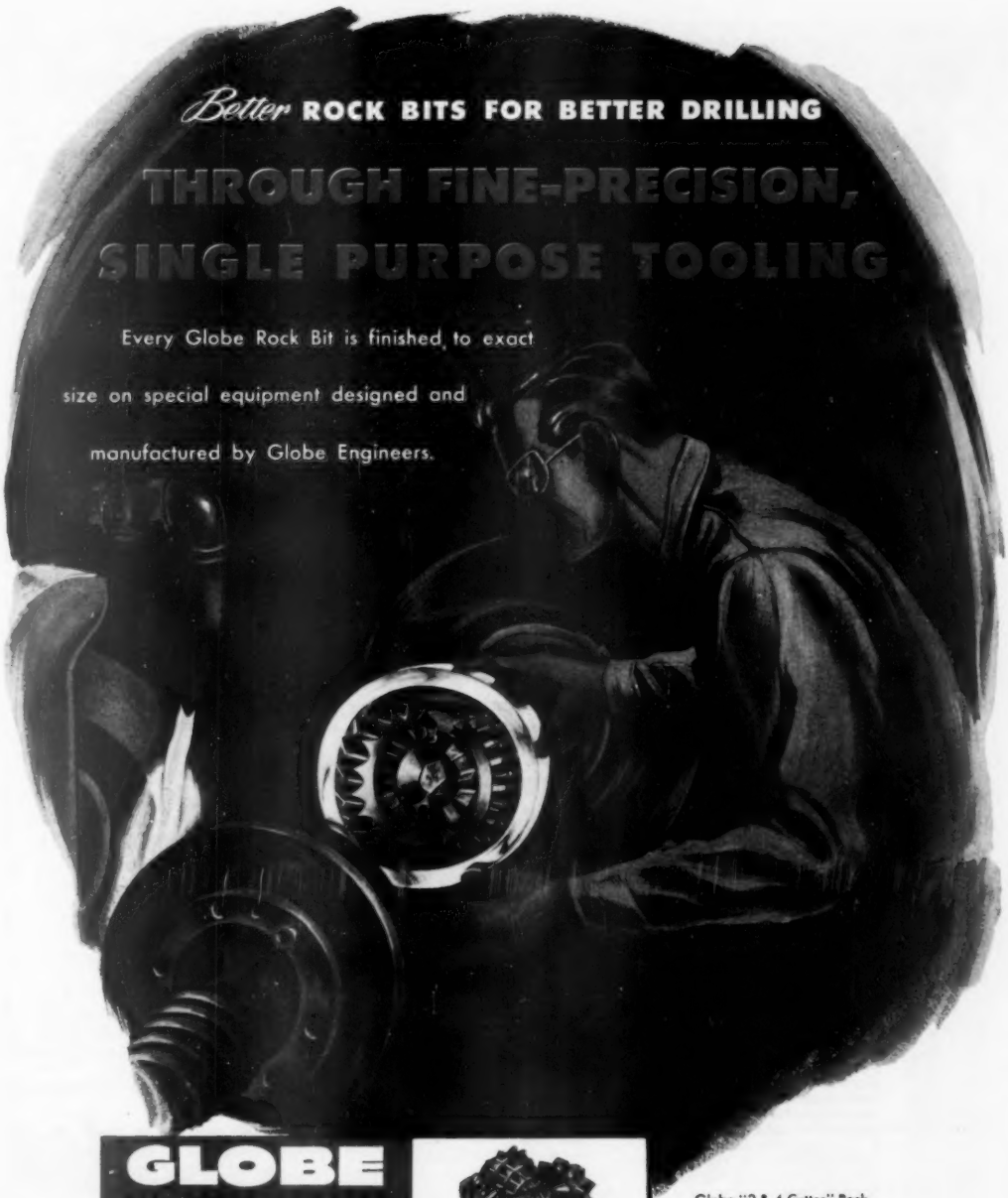

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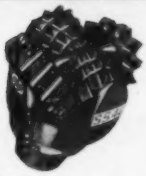

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Charter has been issued to Texas Drillers, Inc., a newly formed drilling firm, located at Seguin, in Guadalupe County, Texas. Incorporators are Clark D. Core, B. E. Lewis, and W. L. Ray.

Sunnyland Contracting Co., Rayne, La., has two active wildcat operations for Sun Oil Co. in northern Florida. One, projected to 6,000 ft., is 1 Brady-Belcher, located in the C NW NW 18-3n-22w, 5 miles east of Crestview, in the eastern part of Okaloosa County, in the panhandle sector, south of the Alabama line. The other, con-

On the floor of a rotary rig W. H. Mart Ripley area of southern Payne County, Okla ingam, floormen; Ed Smalley, derrickman; superintendent; Dr. N. C. Gaddis, Tulsa, a v company.

wer Commission on the United Gas Pipe Line Co.'s ort, to construct about 31 mi atural gas pipe lines from an offshor ield in the Gulf of Mexico to the firm's xisting system in Terrebonne Parish, ouisiana. A time and place for the earings will be set by further order.

The commission modified and affirmed a decision filed last November by FPC Presiding Examiner Glen R. Law which denied United's application. Law's decision was without prejudice to the company's right to file a later application if and when it had available natural gas reserves to make the project economically feasible.

In its decision the commission said the examiner's records show United has

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tracted to 4,500 ft., is 1 McRae, located in the C NE NW 12-6n-11w, 14 miles northwest of Marianna, in Jackson County, in the northeastern corner of the state, south of the Georgia line.

Jet Drilling Co., Wichita and Denver, has a rig under contract to **Helmerich & Payne, Inc.,** Tulsa, for a wildcat test, 1 Head, located 2½ miles south of Hoover, in Logan County, northeastern Colorado. Spot location is in the NW NW NW 21-7n-54w. It also has a new wildcat test under way in western Nebraska at 1 Olson, 7 miles southeast of Harrisburg, in the NW NE SE 5-17n-56w, where it is drilling for D. M. Love and others.

Dorris Ballew, Inc., Natchez, Miss., has a rig working for John S. Callon, also of Natchez, in the Church Hill field Jefferson County, Mississippi. Latest operation is 1 Reason, in 2-8n-2w, scheduled to go to the field's 6,000-ft. Wilcox sand.

R. P. Bufkin, Pleasant Hill, La., is contractor on a shallow Nacatoch test being started for Myers & Jenkins at 1 Calhoun, a wildcat in the C SE NE 11-10n-11w, southwest of the Grogan field, in DeSoto Parish, Louisiana.

Chance Well Service Co., Beaumont, Tex., is contractor on a projected 8,000-ft. wildcat test which Sun Oil Co. is starting in the Batson area of Hardin County, Texas. The test is designated as 1 Second Houston-Galveston Syndicate. Location is in the Willis Donoho Survey.

Lavaca Drilling Co., Houston, has a rig working for Ralph Lowe in the North Danbury area, 9 miles northeast of Angleton, Brazoria County, Texas Gulf Coast. The well, 1-B Senior, DI&C Survey, A-604, is projected to the recently opened Frio pay around 7,900 ft.

Gaines Drilling Co., Corpus Christi, has two new contract jobs under way in southwestern Texas, one for Phillips Petroleum Co. in McMullen County, and the other for F. W. Carr in Live Oak County. The Phillips contract is for a 6,200-ft. test, located 8 miles southeast of Fowlerton, at 3 Mula, in the GWT&T Survey 5. The other is for an 8,500-ft. test, located 4 miles north of George West, at 1 West, in the Cameron County School Land Survey. Both are wildcats.

ACTIVE ROTARY RIGS*

(United States and Western Canada)

Area—	Week ended 3-2-53	Change week ended 2-23-53	Change week ended 3-3-52
Gulf Coast	590	+6	+ 6
N. & W. Tex.-N. M.	790	—3	—222
Ark.-N. La.-E. Tex.	108	—6	— 44
Oklahoma	316	—1	+ 5
Kansas-S. Nebraska	176	+8	— 4
Illinois-Eastern	101	—2	+ 4
Rocky Mountains	184	—1	+ 26
Pacific Coast	163	+1	— 7
Total U. S.	2,428	+2	—236
Western Canada	152	—4	— 29
Total	2,580	—2	—265

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and North and West Texas-New Mexico and Oklahoma-Kansas areas are shown on pages 170-171.

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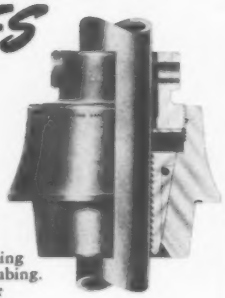

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LEADING THE FIELD OF SEISMIC EXPLORATION

A New "Deepest Producer" Promised

FOR many years it has been predicted that production will be developed down to 20,000 ft. in the tremendous thickness of Miocene sediments occurring along the Louisiana Gulf Coast portion of the greater Mississippi Delta area. Drilling at Weeks Island field in Iberia Parish continues to ease toward that depth as deeper and deeper production is found.

Weeks Island field (C on sketch) is being developed around one of the Five Islands of the Louisiana coast. These "islands" are the result of salt intrusion and take the form of topographic highs which rise more than 100 ft. above the coastal marsh. They were exploited for salt long before the oil potentialities were recognized. The other four islands are: (A) Jefferson, (B) Avery, (D) Cote Blanche, and (E) Belle Isle. All of these piercement-type salt domes are now productive of oil and gas on one or more flanks. All other oil fields shown on sketch are also associated with salt intrusions, most of which are deep-seated masses.

Drilling at Weeks Island field is expected to develop the deepest-producing well in the world before long. In the fall of 1951 Shell Oil Co. found high gas-oil-ratio production (15,370:1) at 16,572-16,600 ft. but elected to plug back to produce from the oil reservoir at 15,296-15,336 ft. for the deepest producer in Louisiana at the time.*

It appears that two wells are now in the deeper reservoir and thus in a position to break the world's producing depth record currently held by Standard Oil Co. of California 5 Mushrush in Wasco field, Kern County, California, which produces from the Eocene to 15,530 ft.

Shell Oil Co. 1 Weeks-Gall unit, 12-14s-6e, which was carried to a depth of 17,083 ft., now has hole cased to 16,932 ft. and is drilling out for tests.

Around the dome to the east about ¾ mile is Humble Oil & Refining Co. 1 Hortense Gonsoulin, 41-14s-7e. This well was drilled to 16,822 ft. and cased

to 16,811 ft. The hole is now plugged back to 16,725 ft. A test at 16,670-16,720 ft. recovered salt water with a trace of oil. This interval was squeezed and perforations at 16,432-92 ft. are now being tested. This well had a show of gas at 15,808-40 ft. and a show of oil at 15,949-91 ft.

Whether or not both, one, or neither of these wells make a record-depth producer remains to be seen, of course. (Additional developments on these two wells will be carried under "South Louisiana" in the section following this page in future issues).

Drilling the flanks of salt domes encounters geology at its trickiest. A complex pattern of small flank-sand traps resulted from the growth of the salt stock which left the strata dipping steeply and faulted in unpredictable directions. Subsurface mapping of these patterns is difficult at best because only unsatisfactory correlations can be made due to rapid facies changes and thickness variations of the Miocene sand bodies.

Drilling to depths now commonplace at Weeks Island was considered questionably economic but a few years ago. The first producer at Weeks Island was completed through perforations at 13,505-20 ft. in 1945. Today this deepest field in the world is Louisiana's biggest producer. Last year the field produced more than 10,700,000 bbl. of oil to bring its cumulative production to nearly 30,000,000 bbl. The average depth of the wells in this big field approaches 15,000 ft. and obviously the production "basement" has not been reached yet.

Philip C. Ingalls.

*Deepest producer in Louisiana today is The Texas Co. C-3 State, Bay St. Elaine field, Terrebone Parish, which is open to 15,362 ft.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

MONTANA . . . The first significant recoveries from the Mississippian (Charles-Madison) on the Baker-Glendive anticline have been reported at Shell Oil Co. 22-23 Unit, NW SE NW 33-10n-58e, in the Cabin Creek area of Fallon County. The company recovered 4,400 ft. of 32.5°-gravity oil from the Mississippian at 7,310-60 ft.

OKLAHOMA . . . The Panhandle area received a new discovery at Carter Oil Co. 1 Tretbar, C NW NE 7-5n-22eCM, Beaver County. The well flowed 4,896 M.c.f. of gas daily from the Morrow sand and 236 M.c.f. from the Chester. The two-zone discovery is located near Floris, south of Greenough pool.

WEST TEXAS . . . Stanolind Oil & Gas Co. 1 Fasken, northeast offset to the Ordovician discovery in Midland Farms field, southeast Andrews County, was showing for greater production than the discovery.

MISSISSIPPI . . . Carter Oil Co. 1 Clem Baskin heirs in eastern Chickasaw County has opened a potentially important gas-condensate field in the Paleozoic area of northeastern Mississippi. The well is being completed from 4,300-60 ft. in the Mississippian Chester zone.

ROCKY MOUNTAIN

MONTANA

Mississippian Recoveries Reported at Fallon Test

Shell Oil Co. has reported recoveries from the Mississippian (Charles-Madison) at its 22-23 Unit, NW SE NW 33-10n-58e, in the Cabin Creek area of Fallon County, which indicates a discovery of potentially great importance to the portion of the Williston basin within this state.

The operator recovered 4,400 ft. of 32.5°-gravity oil from the interval 7,310-60 ft. with tool open 2 hours. Total recovery was 5,300 ft. of fluid, but complete details of the test have not been released by the operator. An earlier test from 7,255-7,310 ft. recovered 500 ft. of gassy oily mud which was 30 per cent oil, 1,150 ft. of gassy, muddy oil, 60 per cent oil, 2,250 ft. of gassy oil, and 400 ft. of oily water which was 50 per cent oil. Flowing pressure on this test was 330-1,540 psi., and shut in pressure was 3,400 psi. Test of an interval from 7,050-95 ft. identified as Charles made gas in 3 minutes at the rate of 2,460 M.c.f. per day, with pipe recovered after 2½ hours of 50 ft. of gassy, watery mud. Flowing pressure on this test was 50-785 psi. shut in pressure 3,300 psi.

This wildcat is the first to recover a significant amount of oil from Mississippian horizons on the Baker-Glendive anticline. Several others have had Mississippian shows, with the Texas Co. completing 1 NPG (NCT 8) in the Woodrow area of Dawson County, about 35 miles to the northwest of Cabin Creek as a temporarily shut in discovery after swabbing 61½ bbl. of oil per day from Madison.

The Cabin Creek wildcat is about 15 miles southeast of Shells Pine Unit which produces from deeper horizons (Devonian-Ordovician). It is northwest of the Little Beaver pool, also opened by Shell, and also an Ordovician producer. The Madison is to date the primary producing formation within the Williston basin, with production at Tioga, Beaver Lodge and East Poplar fields from that horizon. These are the major fields of the basin to date, and the results of Shell's tests at Cabin Creek indicate the possibility of a similar field in that area.

Arrow points to Shell's New Charles Strike.

WYOMING

Apparent Discoveries Near Completion

Four widely separated wildcats in Wyoming which have shown as apparent discoveries on recent tests are working ahead to completion, with all of them at critical stages. At the California Co.'s 1 Unit, SW SE NW 27-53n-100w, on the Spring Creek anticline in Park County, the operator reported swab gage of 63 bbl. of fluid 30-40 per cent water in 20 hours. The wildcat swabbed from the Prosphoria zone 5,057-85 ft., and tests are continuing.

At Walker Dome, Hot Springs County, Forest Oil Co. of Midland and Denver has cored additional Phosphoria saturation at 1 Mill Iron Land and Cattle Co., SE NE NE 8-46n-99w, and is reported pulling core from 6,799 ft. This well is southwest of Little Buffalo basin, one of the better fields in the southwest portion of the Big Horn basin which produces from Phosphoria and Tensleep. The Forest Oil wildcat had shows in Phosphoria with apparently commercial quantities of oil recovered on drill-stem test.

South of Walker Dome, in Fremont County, Stanolind Oil & Gas Co., and Sinclair Oil & Gas Co. are coring in Tensleep at 10,754 ft. This well made 725 ft. of high gravity oil on test of upper Tensleep from 10,727-752 ft. and is apparently an important discovery north of the prolific Sand Draw field.

A wildcat of still undetermined commercial possibilities is Ohio Oil Co.'s 1 Unit, NW NE SW 22-22n-85w, in the Cedar Ridge area of Carbon County. The wildcat is now drilling below 11,410 ft. and has reported no tops since recovery of oil from the interval 10,119-137 ft. in a sand which was apparently a stray in this highly faulted area.

There were 15 new locations announced in Wyoming during the week as the region recovered from a rather severe and extensive blizzard which set the count of active rotaries in the Rockies back to 185 as of February 23. This was the lowest point since the first of 1952. All states share in the current gain with the exception of Nebraska, and to a lesser extend North Dakota.

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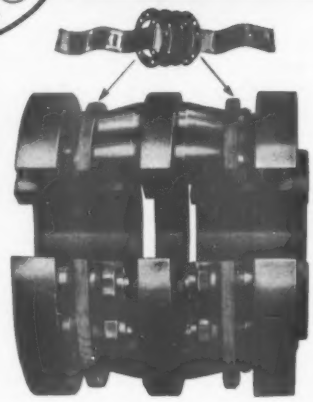

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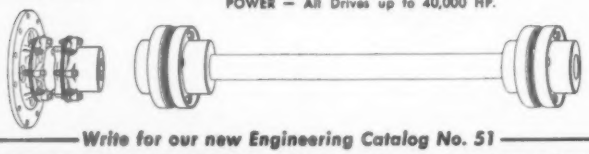

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OKLAHOMA

East Payson Expands

South-central Lincoln County's East Payson pool is one of the state's most active areas since its opening by Gulf Oil Corp. in 1952.

Gulf has completed its 22nd producer in the area at 4 Queenan, NE SW NW 1-12n-4e, for 120 bbl. of oil per day from the lower Skinner pay topped at 4,158 ft. The area has about 50 producers at present making their daily allowable of 100 bbl. per well. The state allowable for the rapidly expanding field is 5,000 bbl. Field development to date has resulted in only one dry hole. There are 11 active wells in the field currently.

Mid-Continent Petroleum Corp., one of the several companies active in the area, has completed 2 Bishop in the NE NE NE Section 36 on a pump gage of 200 bbl. per day. Midstates Oil Corp. has 2 State-McCoy "B," NE NW NW 36-13n-4e, near completion gaging 231 bbl. of oil per day pumping and flowing.

Panhandle Gas Discovery Finaled in Two Zones

The important new producing area in Oklahoma's Panhandle received another new discovery at Carter Oil Co.'s 1 Tretbar, C NW NE 7-5n-22eCM, Beaver County.

The well flowed 4,896 M.c.f. of gas per day through ¾-in. choke from the Morrow sand at 6,315-30 ft. and 236 M.c.f. of gas per day through ¾-in. choke from Chester perforations at 6,526-54 ft. A previous test in the Morrow perforations showed some distillate.

The pool opener or extension is located southeast of the nearest Morrow production in Light gas-distillate field. Geographically the discovery is closer to Greenough pool, which produces oil from the Oswego, but the fact that the new strike is producing from the Morrow and Chester lines it up with Light field and Floris pool.

Recently a new discovery was completed 3 miles northwest of Greenough pool, which is north of the 1 Tretbar. That discovery, J. M. Huber Corp.'s 1 Potter, was completed for 218 bbl. of oil in 5 hours from the Oswego lime. The 1 Potter is 1 mile southeast of Morrow sand gas-distillate production in Light field.

KANSAS

Rooks County Holds Current Interest

The southeastern part of Rooks County is the current active area in Kansas. Three discoveries in that part of the county being proved. Heathman & Co. has set casing at their 1 Ganoung, NE NE SE 31-9s-17w, wildcat 1 mile northeast of Plainsville pool and 1¼ mile northwest of Nettie pool. Operators tested a good show of oil in the conglomerate at 3,538-53 ft. Recovery was 210 ft. of gassy oil. Some shows were found in the Simpson and Arbuckle also.

Champlin Refining Co. is testing after swabbing 130 bbl. of oil in 18 hours at 1 Garvert, SW SW SW 18-19s-17w, new discovery 1¼ miles southeast of Finney pool and 2½ miles north of Burnett pool. The tests are of the conglomerate also.

Trans-Era Petroleum, Inc., has put on the pump their 1 Colby in the NE NE SW 27-10s-17w, wildcat 1½ miles northwest of Brungardt pool. The well swabbed 7 bbl. of oil per hour from the Lansing cut at 3,285 ft.

Other developments on the Central Kansas uplift include Helmerich & Payne, Inc.'s 1 Toland, NE NE NE 10-25s-14w, wildcat 1¼ miles northeast of Jordan pool in southern Stafford County, which is preparing for Viola production tests. A drill-stem test from 4,119-47 ft. recovered 240 ft. oil and gas-cut mud, 150 ft. clean oil and 30 ft. heavily oil-cut mud with 1,300 psi. bottom-hole pressure. In the central part of the county Westgate-Greenland Oil Co. is testing Lansing shows at 1 Radke, NW NW NW 25-23s-14w, wildcat 3 miles southeast of Crissman pool and 2½ miles northwest of the town of St. John. A test of the Lansing from 3,689-99 ft. recovered 2,400 ft. gas and 93 ft. frothy oil.

Central Kansas Uplift Activity at Steady Pace

The Central Kansas uplift area received five new discoveries, and new activity in the area continued its steady pace.

Pratt County received two new discoveries. Ross & Schaefer finished 1 Seidel, NE NE NW 19-27s-12w, for an initial flow of 426 bbl. of oil daily from the Simpson sand at 4,302-16 ft. The discovery is located in the northeastern part of the county, opening Iuka-Oarmi South pool.

The Pratt pool was opened by W. J. Coppinger at 1 Fitzsimmons, SE SE NW 30-27s-13w, with bomb potential of 1,052 bbl. of oil per day from the Lansing from 4,058-71 ft.

Champlin Refining Co. has a new discovery

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in Rooks County at 1 Garvert, SW SW SW 18-10s-17w, wildcat 1 mile east and ½ mile south of Finnesy pool, and 2½ miles north of Burnett pool in the south-central part of the country. Recovery of 600 ft. of oil and 30 ft. of muddy oil was reported on a test of the conglomerate. An earlier Lansing test also recovered some oil.

Southeast of this indicated strike Trans-Era Petroleums, Inc., is testing Lansing perforations at 1 Colby in the NE NE SW 27-10s-17w, wildcat 3 miles northeast of Burnett pool and 2 miles northwest of Brungardt pool.

A new pool is being opened in Ellis County by Peel-Hardman at their probable Arbuckle discovery in the southern part of the county. The 1 Dumler is 1 mile east of Beilman pool in the SW SW SW 19-15s-17w.

TEXAS

SOUTHWEST TEXAS

San Patricio Gets New Pool

A new oil pool has been opened in San Patricio County with the completion by Superior Oil Co. of its 2-1 Welder, located in Section 2, Welder Ranch Subdivision. The well flowed 86 bbl. of 38.2°-gravity oil in 24 hours through 7/64-in. choke with tubing pressure of 575 psi. from casing perforations at 6,588-96 ft. Hole had been drilled to 7,754 ft. Location is about 2½ miles to the west of the Portilla field, nearest production. Section 2 has been designated as the new pool's name.

EAST TEXAS

Tide Water to Drill Smackover Wildcat

Tide Water Associated Oil Co. was reported erecting derrick at 1 Ramey Unit, J. Maxmillian Survey, in the New Hope field of southern Franklin County. Projected depth of 13,000 ft. should be sufficient to penetrate the Smackover limestone.

WEST TEXAS

Deep Field Development Shapes Up Rapidly

Stanolind Oil & Gas Co. 1 Fasken, northeast offset to the Ordovician discovery in the Midland Farms field of southeast Andrews County, was showing for greater production than the discovery.

Last week's test, first in top of the Ellenburger, recovered some oil from 12,590-654 ft. Top of the Ellenburger was 12,605 ft.

Flowing oil was developed on test from 12,582-740 ft. Oil-cut water blanket reached the surface in 77 minutes, which cleared in a short time and when turned into tanks for 15 minutes, gaged 27 bbl. of oil with no water. Oil from was at the rate of 108 bbl. hourly.

Operators cored from 12,740-762 ft. but started losing mud to the formation while coring. Core was recovered after adding lost-circulation material; which was 30 ft. of dolomite, being 1 ft. of dense dolomite with no shows, 21 ft. of medium crystalline, vuggy and oil stained, and 8 ft. of good vuggy porosity with stain and fluorescence.

Following the core, a test from 12,738-770 ft., using 2,500 ft. water blanket, had gas at the top in 70 minutes, water blanket 5 minutes later and oil in 95 minutes. The flow gaged 22½ bbl. the first 15 minutes, then 40 bbl. the next 30 minutes. It was still flowing to test at last report, averaging around 80 bbl. of 52° oil an hour. Location is approximately SW NW 9-42-T1N-T&P.

Stanolind released location for a new test in the area, to be drilled in NW SW of Section 45-41-T2N, south of the above well.

Stanolind 5-F Fasken, Ellenburger test 1 mile southeast of the new area, flowed 50 bbl. of oil in 2 hours on drill-stem test at 8,320-80 ft., probably Wolfcamp; and recovered oil and gas-cut mud in the Pennsylvanian at 9,700-45 ft.

Continental Oil Co. will drill an Ellenburger test 6 miles southeast of Andrews in 24-A44-PSL, as the 1 F. T. McCollum and G. W. Weibusch. Projected depth was 13,500 ft. Location falls 5 miles north of Magnolia Petroleum Co. 1-EA Fasken, Wolfcamp discovery.

Phillips Petroleum Co. 1-RR University, north extension to the opener of the Northeast Andrews-Devonian field, recovered oil on drill-stem test after topping the formation approximately 120 ft. high to 1-CC University, discovery well.

Top of the Devonian was 12,450 ft. on elevation of 3,051 ft. and drill-stem test was run between 12,460-600 ft. Recovery was oil and gas-cut water blanket, plus 7,400 ft. of 41°-oil. Time was 2½ hours.

Magnolia Petroleum Co. has announced location for a Devonian test to be drilled as 1-FA Fasken, in 21-40-T3N-G&MMB&A, ½-mile southeast of Humble Oil & Refining Co. 1-Q University. The latter well opened Devonian pay in the Magutex area.

Deep Wildcat Abandoned

Gulf Oil Corp. 1 Mitchell Brothers-State, Presidio County wildcat 25 miles southeast of Marfa, has been abandoned at 15,996 ft. At that depth it was the deepest hole ever drilled in West Texas. Tentative top on the Ellenburger was 15,235 ft., minus datum point of 9,897 ft. The last reported drill-stem test at 15,686-996 ft. recovered drilling mud with no shows.

The test was originally drilled dry to 9,997 ft. by Argo Oil Corp.

NORTH CENTRAL TEXAS

Conglomerate Extension Flowing Oil

Texas Pacific Coal & Oil Co. 1 Upshaw, Stonewall County wildcat, was assured of production from the Bend conglomerate section on basis of drill-stem tests.

Sample top on the formation was 6,012 ft. First drill-stem test from 6,010-22 ft., open 37 minutes, recovered 2,760 ft. of oil and 20 ft. of heavily oil-cut mud. Operators then cored ahead from 6,022-54 ft., penetrating 7½ ft. into the Mississippian, and recovering an additional 21½ ft. of sandy conglomerate with oil shows.

A 2-hour test from 6,033-54 ft., total depth, had gas in 7 minutes and flowing oil in 10 minutes. Gaged through ¼-in. choke, the well made 20 bbl. of oil an hour. Flowing pressure ranged from 1,500-2,300 psi.

Location in 82-D-H&TC is approximately 1½ miles northwest of conglomerate production in the Boyd field of east-central Stonewall County.

Clay Has New Pay, Twin Test Started

L. T. Burns 1 Tom Watson, development test in the McKinlay field of Clay County, found flowing oil in a 3,500-ft. sand while drilling to the regular pay around 4,200-4,450 ft. Drill-stem test of the new sand reported flowing oil, with no gages available. Operators set casing for completion and skidded the rig 50 ft. for a twin test to the regular pay.

TEXAS PANHANDLE

Quinduno Expands

The Texas Panhandle's Quinduno field in Roberts County continues its rapid development.

Five new locations were announced for the field, Gulf Oil Corp. credited with four. The new field, opened by Gulf in 1952, has been the area's hottest development spot since its discovery. The southeast extension area of the field is being rapidly proved with new indicated producers.

Shamrock Oil & Gas Corp. 4 Maddox, Section 158, Block M-2, BS&F Survey, is at total depth of 4,110 ft. in the Brown dolomite with casing set for completions. A drill-stem test in the Brown dolomite from 4,077-4,100 ft. gave up 1,200 ft. of oil with gas at the rate of 60 M.c.f. per day. Creslenn Oil Co. has an indicated producer at 1 Beulah Edge, Section 169, Block M-2, BS&F Survey, after recovering 3,640 ft. of oil and gas at the rate of 291 M.c.f. per day from the dolomite at 4,098-4,120 ft.

Gulf has several wells in testing stages in the field. The 1 McCuistion "A" in Section 193 is testing the field's indicated deep pay, Pennsylvanian granite wash, from 6,200-45 ft.

TEXAS GULF COAST

Colorado County Wildcat Produces Gas Condensate

Another gas-condensate producing area located 2½ miles northwest of Chesterville and about 1½ miles north of other production in the Chesterville field, in eastern Colorado County, is being proved by Sherwood & Blohm at their 1 Van Werden, GH & H Survey 21, A-248, now being completed in Yegua sand with casing perforated at 6,390-95 ft. On open flow, the well produced at the rate of 41,000,000 cu. ft. of gas per day with a gas-fluid ratio of 62,500 cu. ft. per barrel. Fluid was 57.4°-gravity condensate. Shut-in pressure gaged 2,373 psi.

This is an old hole, drilled by Fidelity Oil & Royalty Co. and reported as dry in February 1948. The Chesterfield field, discovered in 1943, produces gas, condensate, and oil from the Yegua at depths of 6,050 to 6,100 ft., and gas-condensate from the Wilcox at depths of 9,200 to 9,300 ft.

New Pay for Clinton Field

A new oil-productive zone in the Frio section is being opened in the Clinton field, east of Houston, in Harris County. The discovery well, drilled by H. R. Smith at his 2 Locke unit, in the Reels & Trobough Survey, A-59, flowed 120 bbl. of 30.5°-gravity oil in 24 hours through 8/64-in. choke with tubing pressure of 720 psi. Pay is open through casing perforations at 5,755½-59½ ft. Operators plan to complete the well both in this pay and in a 5,400-ft. gas sand.

ARKANSAS

New Pay at Springhill

The two-state Springhill field of Arkansas and northern Louisiana has a new pay, the

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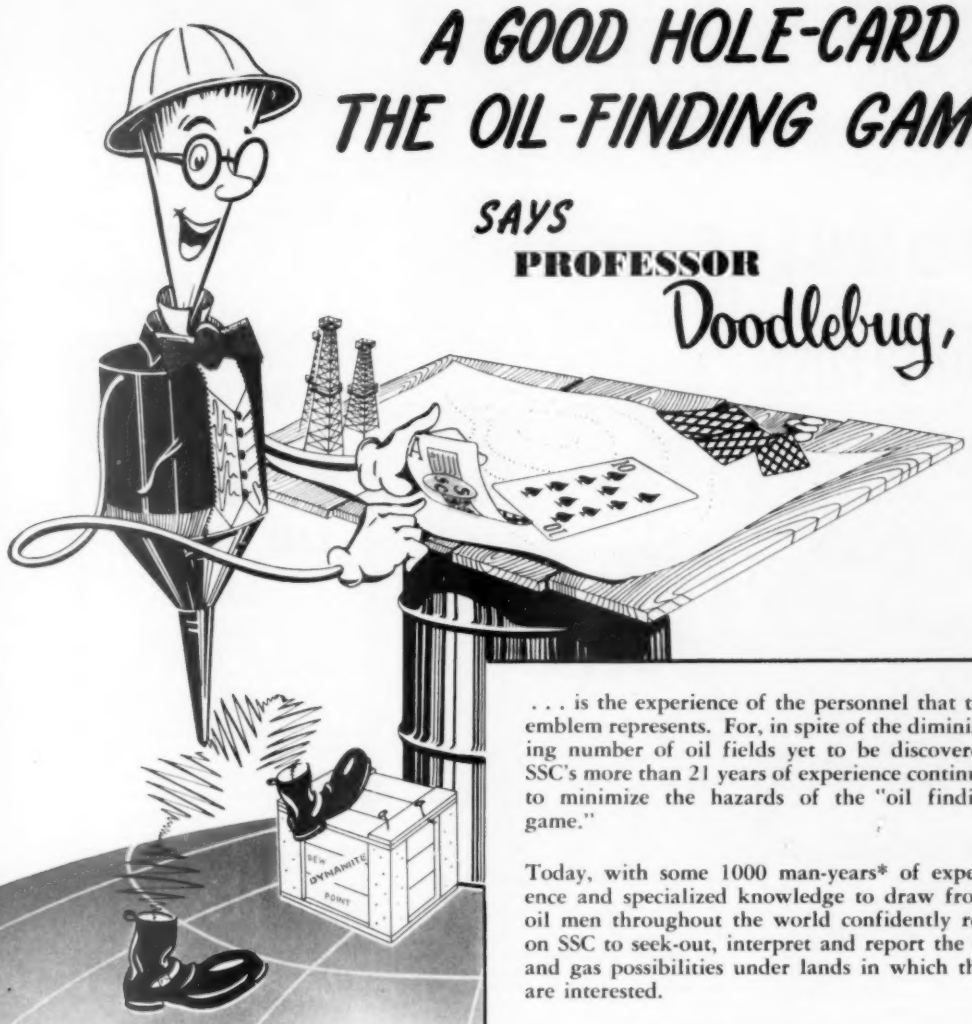

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Hill sand. Regular pay in the field is the Tokio.

Hunt Oil Co. completed the new zone discovery flowing 221 bbl. of 43.7°-gravity oil per day through open 2-in. tubing. The 2 Dennis is located in Section 11-20s-23w, ½ mile west of the field's Tokio production and ½ mile north of the town of Springhill, Louisiana. The production came from perforations at 5,025-30, 5,052-58, and 5,068-75 ft. in the Hill sand of the Rodessa series. Pay in the field has been the Tokio at about 3,200 ft.

There are 24 producing wells on the Arkansas side of the new field. The new producing zone will give impetus to the steady development of the field and surrounding area. Springhill Tokio production on the Arkansas side of the field has been practically defined. Additional development activity can be expected on the western side of the reservoir. The daily allowable on the Louisiana side of the field is 3,049 bbl. Monthly production on the Arkansas side of the field is running over 50,000 bbl.

Hunt has set surface casing at a new 5,500-ft. Rodessa test in the area, and is moving in at another. The firm will begin development of the new Hill pay at 1 Payne et al in Section 11-20s-23w, immediately north of the discovery, while the 1 Dennis will drill in 10-20s-23w, about ½ mile west of the Hill discovery.

CALIFORNIA

CALIFORNIA

New Field Discovery Made West of McKittrick

Moriqui Exploration Co. has made a new discovery near McKittrick, on the western side of San Joaquin Valley and 2 miles west of nearest production. On a 12-hour test the wildcat, 4 Anderson, flowed 412 bbl. of clean oil through a ½-in. choke. Tubing pressure was 275 psi, and the crude was estimated at 37° gravity.

Production was from 3,450-90 ft., the latter being total depth. The sand was believed to be Oceanic (Oligocene), which is productive at Belgian Anticline about 2½ miles southeast. Acreage around the wildcat, which is in SE NW 15-30-21e, is largely held by Shell Oil Co., Ohio Oil Co., and Tide Water Associated Oil Co. Moriqui, and joint-operator A. J. West, will start a west offset, 1 Tide Water Associated Fee, later this month.

Tapo Canyon Activity

Two offsets were getting under way in the South Tapo Canyon area of Ventura County where Terry Drilling Co. 2 Tapo opened a new Luisian (Miocene) pool. Terry was starting 3 Tapo in NE NE 13-3n-18w as an east offset and Union Oil Co. had moved in to drill 1-12 Simi as a north step-out. The discovery last week was flowing 625 bbl. daily through perforations at 2,370-2,507 ft.

Failures Plague Edison Find

Three attempts to extend production at Crown Drilling Co.'s recent new pool discovery in the Edison area on the eastern side of the valley have ended in failures. Catalano and Stansbury 16-8 Drury in NW SW 8-30s-29e, ¾ west of the 76-8 Jeppi-Camp discovery, was abandoned at 3,201 ft. About ½ mile southeast of the discovery General Petroleum Corp. 27-9 Graham failed to find production in drilling to 6,744 ft. An earlier attempt by Stansbury-Webb to extend production ½ mile south also was a failure.

A northwest step-out to Graham pool in NW NE Section 9, discovered by General Petroleum Corp. last fall, also was a failure. It was the Donald Frankel 1 H. C. Levi, in NE SW Section 4, which was abandoned at 4,880 ft. General Petroleum has three rigs at work developing this discovery.

Eocene Search Spreading

The search for Eocene production along the southern edges of San Joaquin Valley has intensified so that wildcats were underway from the Tejon Ranch area west to Maricopa. Six deep tests were drilling or preparing to start in this 25-mile stretch. On the south-

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western edge of the valley an additional three were under way or planned.

Humble Oil & Refining Co. was preparing to start a deep test at Pleito Creek, 4 miles west of Wheeler Ridge where Richfield Oil Corp. discovered Eocene production to touch off the new search. The new test, expected to go to below 11,000 ft., will be 16 K.C.L.-B in SE 35-11n-21w.

In the Tejon area, Standard Oil Co. of California was starting the approximately 13,000-ft. test it staked last January. The wildcat, 35 C.C.M.O. in 32-11n-19w, is in an 800-acre block on which Standard controls the drilling rights below 6,000 ft.

LOUISIANA

NORTH LOUISIANA

Rank Wildcat for Madison

Operations will begin within 90 days at a rank wildcat about 11 miles east of Tallulah, Madison Parish, Louisiana. The test will go to 6,500 ft. to test the sand series of the Tuscaloosa and Paluxy formations. D. E. Vasser will drill the test in the C NE NE 50-17n-13e. Madison Parish is in the northeastern part of the state on the Mississippi River.

Test Drills Near Springhill

Pan-Am Southern Corp. is reaming to core ahead at 1 J. M. Browning et al in the C SW SW 28-23n-10w, wildcat 3½ miles southeast of Springhill field. No shows have been reported as yet at the wildcat with the last core made at 5,927-77 ft.

Springhill field was the best discovery from the development standpoint in North Louisiana in 1952. The field produces about 1,000 bbl. of oil per day from the Tokio in a two-state area. The field extends from the town of Springhill, Webster Parish, into Arkansas. Producing depth is about 3,100 ft.

SOUTH LOUISIANA

Two Weeks Island Wells Test 16,000-Ft. Horizons

Weeks Island, in Iberia Parish, with two wells now testing possible productive sands below 16,000 ft., again is bidding to become the world's deepest producing field. Present deepest production is claimed by the Wasco field, in Kern County, California, where Standard Oil Co. of California has a well, completed several years ago, at a total depth of 15,562 ft.

The two new deep wells at Weeks Island are Humble Oil & Refining Co. 1 Hortense Gonsoulin and Shell Oil Co. 1 Weeks-Gall Unit, both located on the northeast flank, about ¾ mile apart, the former in 41-14s-7e, and the latter in 12-14s-6e.

Humble's well was drilled to 16,822 ft. and cased to 16,811 ft. With hole plugged back to 16,725 ft., initial perforations were made of an interval at 16,670-20 ft., where a drill-stem test recovered 1,200 ft. of gas-cut mud with a trace of oil along with 7,500 ft. of salt water. These perforations were squeezed, and casing reperforated higher in the prospective pay at 16,432-92 ft., where, as this is written, testing is under way.

Shell's well, drilled to 17,083 ft., has pipe run to 16,932 ft., and, at latest report, was drilling out cement preparatory to perforating.

Once before, late in 1951, Weeks Island came near breaking California's deep-producing record when a well, drilled by Shell, tested high gas-oil ratio production at a depth interval of 16,572-616 ft. Because of the high ratio (15,370 cu. ft. per barrel), operators elected, however, to complete the well in a slightly higher sand at an interval of 15,296-336 ft., where low-ratio oil production was obtained.

APPALACHIAN AREA

OHIO

B. H. Putnam et al completed two Oriskany sand wells in the southern part of Belpre Township, Washington County, that responded to treatment. The 1 C. E. Holdren, Lot 1014, gaged 225,000 cu. ft. natural from sand at 4,132-60 ft., and increased to 1,100,000 cu. ft.; the 1 H. J. Lipps, Lot 1015, showed no gas natural in sand at 4,112-39 ft., but shut-in at 450,000 cu. ft. when completed. The same operator is drilling a wildcat test on Charles Foster, Section 23, Sharon Township, Noble County, and another on Cecil Deist, Section 30, Center Township, Morgan County.

KENTUCKY

EASTERN KENTUCKY

In Elliott County Grant Rice 3 T. Whitt, a wildcat 3 miles northeast of Newfoundland and located in 2-T-28 was drilling at 567 ft. Test is in an area where the Mississippian Weir sandstone is the principal producing horizon.

In Estill County 21-P-68 Raydure is drilling at 1,375 ft. at 1 Omar Shouse. Test is in Irvine Furnace pool and is designed to test

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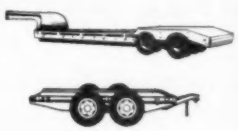

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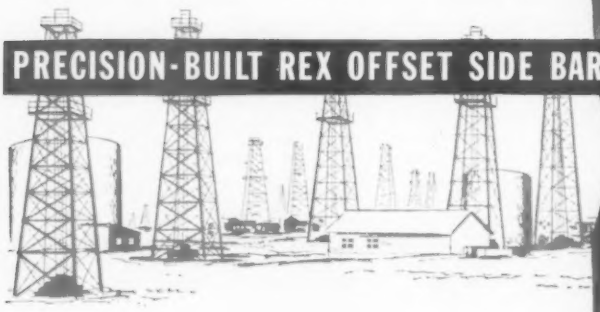

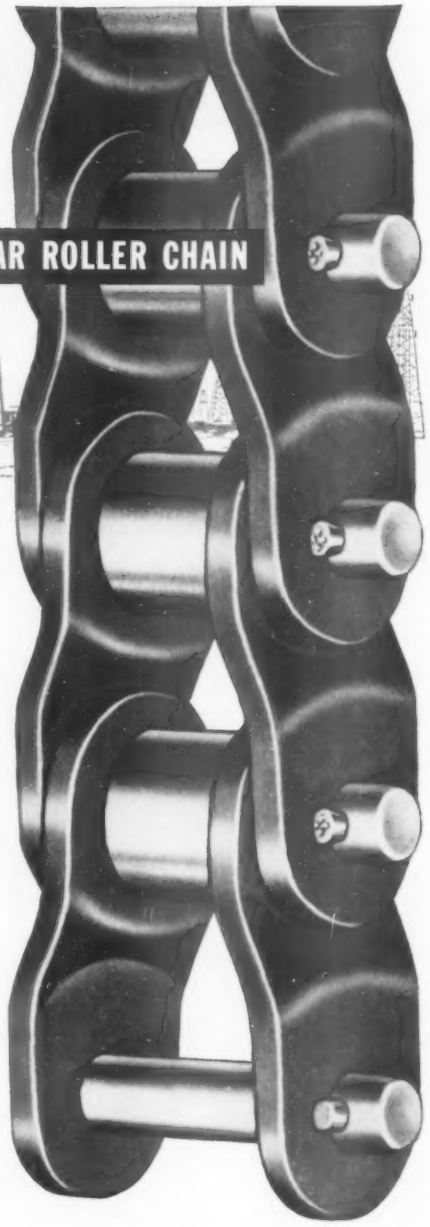

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CANADA

Central Alberta Has Four New Strikes

Three light gravity crude oil discoveries and a strike of natural gas in the central sector of Alberta highlighted the past week's exploration activities in western Canada. Two of the oil discoveries were chalked up at Alberta wildcats that had not previously found oil or natural gas, while the third was made at Cal-Standard's Homeglen test that was chalked up as a 'wet gas' discovery almost a month ago, and this week encountered a D3 oil column. The gas find was made in the Sullivan Lake area of the province, and was the first indication of success at that well.

California Standard's 3-29 Homeglan Driller, LSD 3, 29-43-1w5, 14 miles south-southwest of Pigeon Lake Devonian oil wells opened up and tested approximately 400 ft. of gas and condensate bearing D3 formation before entering the oil column. First drill-stem test run in the oil-saturated formation at the well, of interval 7,951-76 ft., flowed clean crude oil to surface at a daily rate of 240 bbl. Natural gas flow rate during that test was measured at 3.5 million cu. ft. Subsequent tests in the formation have proved the zone to be water free down to 7,986 ft. and crew is continuing to core and test at 10-ft. intervals.

D3 Devonian oil was also discovered at a wildcat in the Samson Lake area, some 4½ miles south of the Malmo Devonian oil production region by a team including the Seaboard-Honolulu-Merrill-Canadian Colleries and Canadian Gulf Oil Company Group. That discovery well, Seaboard Gulf 1 Samson Lake, LSD 1, 20-43-22w4, contacted the D3 reef at 5,352 ft. and flowed some oil to surface on initial drill-stem test. Forty-five-minute test from 5,330-60 ft. flowed gas at a rate of 6.5 million cu. ft. daily and flowed mud and oil to the surface. Pipe recovery consisted of 180 ft. of light green crude, estimated gravity of 35-40°, and 900 ft. oil-cut mud. Crew is now coring below 5,360 ft.

The third oil discovery this week and the gas strike were both made in the Viking sand formation. The oil was found at Anglo American 1 Camrose driller, LSD 10, 23-47-20w4, 1¾ miles northwest of previous oil production and 3 miles north of the town of Camrose. An oil spray was recorded on drill-stem test of the discovery formation, with those tests indicated about 6½ ft. of oil sand being present. Crew is now drilling ahead to 3,225 ft., preliminary to running logs and completing the well.

Viking gas was found at Sinclair Canada Oil Company's C. P. R. 1 Giere well, LSD 6, 15-33-13w4, near Sullivan Lake and some 42 miles northeast of Drumheller oil production. Gas flowed at 2.8 million cu. ft. daily during test of interval 3,200-33 ft. There was no pipe recovery on the single test run the discovery zone, and crew is now heading down for its main objectives in the Devonian formations.

The Stockton Syndicate, a group of Drumheller businessmen that discovered natural gas at their first well, drilled on a Socony Vacuum Exploration Co. farmout a few miles south of Drumheller, have established an initial potential of 44,500,000 cu. ft. daily at

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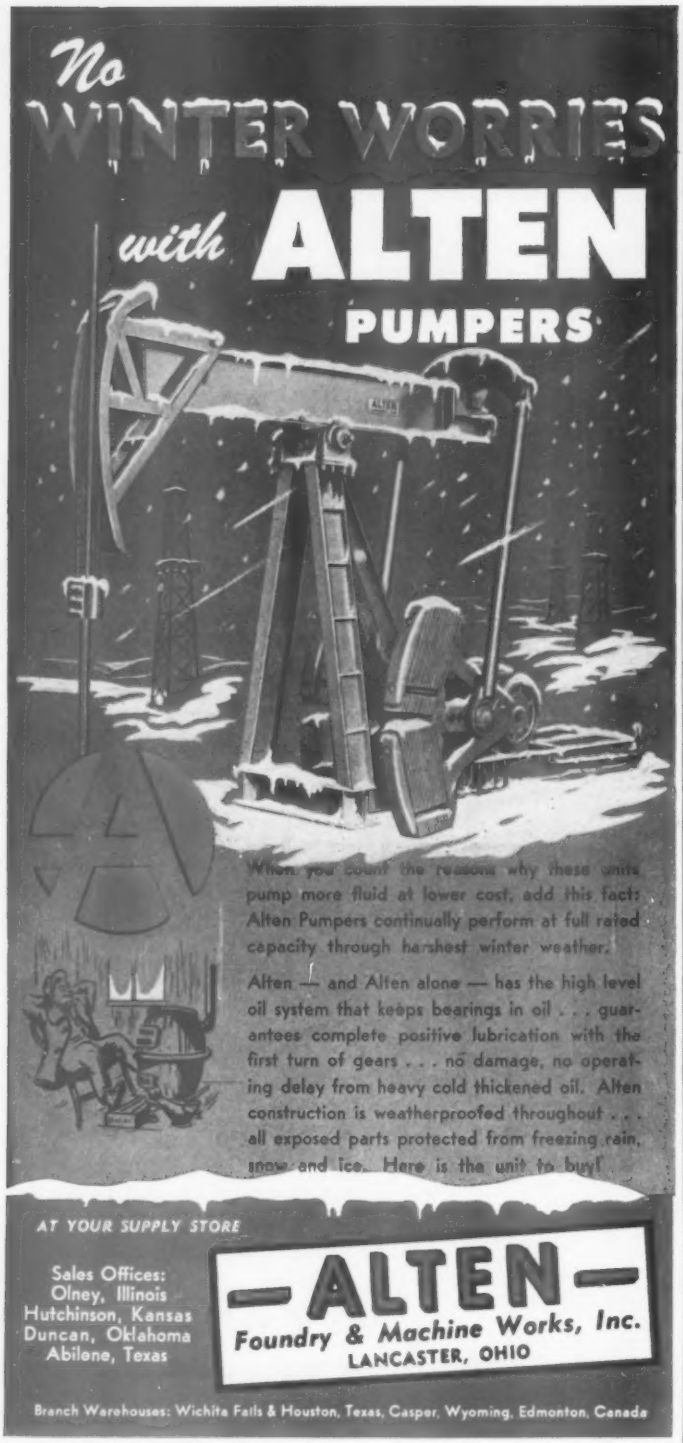
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that Lower Cretaceous strike. The potential is rated as absolute, and was based on back pressure tests run by engineers of the Petroleum and Natural Conservation Board of Alberta.

The well, Stockton Socony C. P. R. 1 Drumheller, LSD 10, 22-28-20w4, is located on a 6-section Socony farmout about 3½ miles south of Drumheller and 6½ miles southwest of D2 Devonian oil producers. The 1 Stockton contacted the glauconitic Cretaceous gas sand at 4,394 ft., or 1,638 ft. below sea level. The 18-ft. pay section, from 4,394-4,412 ft., was perforated with four shots per foot prior to running potential tests. Hole has now been capped, pending a market outlet for its product, further drilling by group in the area is contemplated.

MICHIGAN

Offset Misses Pay

First offset to the probable new Traverse oil discovery well in Jackson County appeared to have missed an oil pay in this objective horizon. Well was filling with water from that zone as this report was being written. This first failure at the diagonal southeast 20-acre offset to Allied Investments, Inc. 1 Hubbard, SW SW SW 30-3s-3w, Concord Township, was Allieds E Grundeman, NE NW NW 1-4s-3w, Pulaski Township. Traverse lime was logged at 1,625 ft. A good show of gas was reported 1,625-26 ft. followed by 600 ft. of salt water at that point in 45 minutes and hole was continuing to fill up with water.

Meanwhile, the Allied 1 Hubbard, which probably will be rated as a Traverse oil discovery well, has been delayed in completion in the Traverse after being acidized because of what is termed "mechanical difficulties" in getting the well to pump properly. Traverse lime was logged at 1,627 ft. and hole was drilled to 1,628 ft., total depth, where well showed an estimated 40,000 cu. ft. of gas a day natural and 500 ft. of fluid, mostly all oil, in 44 hours. After being acidized with 500 gal., well pumped and flowed at a restricted rate of from 8 to 10 bbl. of oil an hour, with no water showing, and until the one 210 bbl. stock tank on the lease at the time had been filled. This initial production after acid totaled about 160 bbl. of net oil before well was shut in for lack of tank space. After additional tanks and surface oil treating and pumping equipment had been installed, well has pumped and flowed anywhere from 4 bbl. of oil in a half hour, after which time it appears to be flowed off, to as much as 28 bbl. in 15 hours. Last reported production showed recover of 18, 12 and 9 bbl. of oil during three different 24-hour tests. Further corrective work was in progress in an effort to get the well on a more steady production program.

NEW MEXICO

SOUTHEAST NEW MEXICO

Eddy Exploration Swabs On Deep Section

Testing continued at Gulf Oil Corp. 1 Federal-General American, gas-distillate prospect in the shallow Grayburg-Jackson field. Swabbing recovered 63 bbl. of load oil and 8 bbl. of acid water in 13 hours. Current tests are an open-hole section in the Pennsylvanian at 11,149-424 ft. Total depth was 13,341 ft.,

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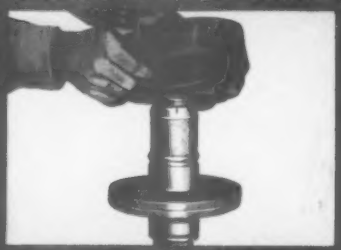

With the new Mission Rubbers installed, the piston is ready for another long run at a fraction of the cost of a new piston.

The secret to lower costs is right under your thumb . . . embossed on this page. Change the rubbers and save the piston! With Mission you reduce piston renewal costs three ways: (1) It's easier to replace piston rubbers because you don't have to remove the piston from the rod. (2) It's cheaper because you save the cost of the piston body. (3) Long-life rubbers make replacement less frequent. This means less down-time when Mission Pistons are used. Mission products are available in all supply stores. Specify "all-Mission."

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in the Ellenburger. Previous tests from 11,173 ft. recovered gas and 54° oil.

Gas-distillate production on the north side of the Moore field of Lea County was reported for Amerada Petroleum Corp. 1-A Coleman Robinson, Section 14. A four-hour test from 9,145-92 ft. sprayed gas and mud, and recovered 1,824 ft. of 54° oil. Production in the Moore area ranges from the Wolfcamp to the Devonian.

NORTHWEST NEW MEXICO

Two important new gas discoveries in the San Juan basin have been completed. Southern Union Gas Co. finaled 1-A Navajo Texas, C SW SW 36-32n-18w, in the North Chimney Rock area, for a gage of 13,900 M.c.f. of gas per day from the Paradox. The discovery is located west of Barker Creek field, one of the Rockies' biggest gas fields. Colorado Oil & Gas Co. has extended the basin's gas area with a Cliffhouse discovery at 5 Rosa unit, Rio Arriba County. The well flowed 548 M.c.f. daily.

MISSISSIPPI

Fracturing Boosts Flow In Chickasaw Discovery

Hydraulic fracturing of the pay zone at Carter Oil Co.'s new discovery well, 1 Clem Baskin heirs, in eastern Chickasaw County, in the Paleozoic area of northeastern Mississippi, has improved productivity of the well substantially and definitely established the opening of a potentially important gas-condensate field, the third for that general region.

The well now is being completed after a series of production tests wth pay zone at 4,300-60 ft. in the Mississippian Chester zone. During its final production test of 16-hour's duration, it flowed at the rate of 3,580,000 cu. ft. of gas per day and recovered 40 bbl. of 60°-gravity condensate. Flow was through ⅜-in. well choke and ½-in. choke at the separator with pressure of 1,490 psi. Prior to fracturing the pay, the flow rate was only 564,000 cu. ft. of gas per day through the same choke.

The new field has been designated as Trebloc, getting its name from a small community located a mile to the southwest. Section location is 19-14s-5e.

First Oil at Sandy Hook

First oil production for the Sandy Hook field, Marion County, has been established with completion by Humble Oil & Refining Co. of its 1 Sandy Hook Gas Unit 24 flowing 105 bbl. of oil daily through ⅛-in. choke. Casing is perforated at 9,044-48 ft. in the lower Tuscaloosa zone, to which the well was deepened after failing to find production in the field's shallower gas-condensate sands.

New Wilcox Discovery For Jefferson County

The new field being opened by Lyle Cashion and associates in eastern Jefferson County, on the west side of the state, appears to be one of Mississippi's better Wilcox sand discoveries, judging from showings at the start of production tests. It will be known as Idlewilde.

While still cleaning, the discovery well, 1 Gordon-Stowers-Armstrong, located in 17-9n-1w, was flowing at the rate of 80 bbl. of fluid per day through 6/64-in. choke. Fluid was 60 per cent oil and 40 per cent wash water. Flowing pressure was 375 psi. Pay is open through casing perforations opposite the top 2 ft. at 5,326-28 ft.

Location of the well, in 17-9n-1w, is 4 miles west of the Fayette field, and 4 miles northeast of the Church Hill field.

WILDCAT COMPLETIONS

TEXAS GULF COAST

Bee County: Kirks Brothers 2-B Mangus Beck, Uranga Survey. Dry. TD 5,069 ft.

W. Earle Rowe 2 Sudie Scott, Juan de Dios Molina Survey, A-41. Dry. TD 3,525 ft.

Goliad County: Second M. E. Andrews, Ltd., and Dallas Husky 1-U Regina New, James Callahan Survey. Dry. TD 3,602 ft.

* Hardin County: Shell Oil Co. 1 Kirby Tract 17-B, Ignacio Villegas Survey, A-54. IP 14 BOPD, 16/64-in., 36°, basal Yegua 8,985-9,011 ft. TD 9,641 ft. (extends Arriola field).

* Harris County: The Texas Co. 1 Hoffman, I & GN Survey 3. IP 1,644 M.c.f., Yegua 7,580-88 ft. TD 7,995 ft. (new pay in Finrock field).

Jefferson County: H. E. Dishman et al 1 Edwards, Thomas Speer Survey, A-50. Dry. TD 7,550 ft.

Tyler County: K. D. Owen 1-C Wheat et al, W. R. Richardson Survey, A-813. Dry. TD 10,800 ft.

EAST TEXAS

Anderson County: Raymond Shannon and R. C. English 1 G. F. Lively, A. B. Davis Sur., A-16. Dry. TD 605 ft.

Bowie County: W. M. Coats and R. E. Moore 1 Lumpkin Estate, F. B. Gunn Sur. Dry. TD 4,434 ft.

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THE OIL AND GAS JOURNAL

"It's a scorcher—brother, will I be glad to sit down and have a nice cool drink of—yowee!!"

WILDCAT COMPLETIONS

Renwar Oil Corp. 1 E. B. McGee, C. M. Collum Sur. Dry. TD 3,405 ft.

Cass County: W. L. Pickens 1 Horace Hillard, O. S. Haygood Sur. Dry. TD 7,010 ft.

Lamar County: Alma & McCutchin 1 C. B. Roberts, I. J. Nowell Sur. Dry. TD 2,415 ft.

Limestone County: W. B. Hinton 1 R. W. Carter, T. Stephens Sur., A-499. Dry. TD 3,045 ft.

Rains County: Alton Coats 1 John Coats, James Hunter Sur., A-120. Dry. TD 6,600 ft.

Red River County: H. L. Voorhees and D. W. Shelton 1 A. R. Davis, Wm. Roach Sur., A-737. Dry. TD 3,476 ft.

WEST CENTRAL TEXAS

Brown County: Trans-Tex Exploration Co. 1 A. A. Martin, Sec. 46, HT&B Sur. Dry. TD 1,528 ft.

Coleman County: Hickok & Reynolds, Inc. 1,759 Miller, Sec. 759, IRR Sur. Dry. TD 3,550 ft. in Ellenburger.

L. J. Maxwell 3 Mrs. Mattie Miller, Sec. 728, David Breeding Sur. Dry. TD 2,133 ft.

Miller & Banks 1 G. D. Odom, Sec. 730, A. Quigley Sur. Dry. TD 2,230 ft.

Fisher County: Lon H. Cron 1 J. A. Brown, 12-2-H&TC. Dry. TD 5,879 ft.

* Shackelford County: C. B. Christie 1 T. G. Hendrick, Sec. 160, ETRR. IPP 21 BOPD, 41°. TD 1,700 ft.

Stephens County: Connally-Jackson 1 E. C. Head, 15-7-T&P. Dry. TD 3,916 ft.

* Connally-Jackson 1 J. Rush, 25-7-T&P. IP 114.7 BOPD, 20/64-in., pay 3,622 ft. TD 4,070 ft.

Taylor County: Clark & Cowden Production Co. 1 Carrie Laney, 31-17-T&P. Dry. TD 3,400 ft.

R. G. Piper 1 E. D. Thomas, 33-17-T&P. Dry. TD 3,471 ft.

NORTH TEXAS

Archer County: R. W. Darden and A. Kriss 1 Earl Bearden, BBB&C Sur., A-54. Dry. TD 1,105 ft.

Pat Fowler 2 T. V. Carr, Sec. 2437, TE&L Sur. Dry. TD 1,466 ft.

* L. V. Hull 1-C Fred Daume, SPRR Sur. 1, A-422. IPP 6 BOPD, sand 648-43 ft. TD 653 ft.

S. F. Hutcheson 1 Langford Investment Co., Blk. 148, J. W. Harris Subd. Dry. TD 1,430 ft.

S. F. Hutcheson 2 Langford, Blk. 148, John Harris Subd. Dry. TD 1,190 ft.

Panhandle Oil Corp. 1-A Steen, C. Ballinger Sur., A-14. Dry. TD 3,727 ft.

W. C. Wainwright 1 J. C. King, 2242-A559-TE&L. Dry. TD 1,469 ft.

Winfrey Drilling Co. 1 Mary Steen Estate, Blk. 1, IRR Sur., A-237. Dry. TD 795 ft.

* Clay County: Ada Oil Co. 1 J. E. Moore, Blk. 21, Hopkins CSL, A-176. IPP 66 BOPD, 42°, sand 4,619-36 ft. TD 4,636 ft.

L. T. Burns 1 H. F. Butler, 3234-A-595-TE&L. Dry. TD 4,652 ft.

Tom B. Medders 1-B Howard Estate, Blk. 42, T. J. Belcher Subd. Dry. TD 5,630 ft.

Cooke County: W. P. Luse 1 W. B. Hinton, J. B. Botard Sur., A-75. Dry. TD 3,391 ft.

* Jack County: Star Oil Co. 1 O. Henderson, H&GN Sur., A-2230. IPP 13 BOPD, 40°, Caddo 4,948-54 ft. TD 5,235 ft.

* L. C. Hewitt 1 J. W. Kinder, Sec. 2668, TE&L. IP 420 BOPD, 32/64-in., 42°, Marble Falls 4,147-76 ft. TD 4,216 ft.

* Frank Wood & Associates 1-E Dixson, N. Bailey Sur., A-1040. IP 153 BOPD, 20/64-in., 42°, pay 3,200-19 ft. TD 3,260 ft.

Knox County: Ultra Oil Co. 1 W. P. Clonts, D. G. Burnett Sur. 6. Dry. TD 5,853 ft. in Pennsylvanian conglomerate.

Wichita County: J. C. Man Jr. 1 Goodman heirs, Blk. 40, A-33, Cherokee CSL. Dry. TD 5,010 ft.

Wilbarger County: James Blair Baker 1-PP Waggoner, 52-4-H&TC. Dry. TD 2,036 ft.

Ben F. Lowell 1-F Waggoner, 1-4-H&TC. Dry. TD 2,510 ft.

* E. H. Pigg 1 Pigg-Castlebury, 67-14-H&TC. IPP 31.7 BOPD, 40°, pay 1,941-47 ft. TD 1,990 ft.

* Young County: L. T. Burns 1 Wilton, S. Tynes Sur., A-274. IP 168 BOPD, 18/64-in., 40°. Strawn sand 3,434-50 ft. TD 3,600 ft.

S. D. Johnson 1 Eleanor Watson, TE&L Sur., A-393. Dry. TD 4,498 ft.

Russell Maguire 1 Gilmore, J. Birdwell Sur., A-1568. Dry. TD 3,996 ft. in Caddo.

SOUTHEAST NEW MEXICO

* Eddy County: R. S. Mac Gruder 1 State, 15-21s-27e. IPP 10 BOPD, 16°, Yates 550-58 ft. TD 561 ft.

United States Smelting, Refining & Mining Co. 1 Kelly-Federal, 10-23s-23e. Dry. TD 2,108 ft. in Glorietta.

Lea County: Mid-Continent Petroleum Corp. 1 Betty Dickinson, Unit A, 20-10s-36e. Dry. TD 12,950 ft. in dolomite.

NORTHERN NEW MEXICO

* Rio Arriba County: Colorado Oil & Gas Co. 5 Rosa unit, SW NE NE 26-31n-6w. IP 548 M.f.c. gas daily, Cliffhouse 5,320 ft., TD 5,740 ft.

* San Juan County: Southern Union 1-A Navajo Texas, C SW SW 36-32n-18w. IP 13,900 M.c.f. gas per day, Paradox 7,040 ft., TD 8,150 ft.

Three States 1 Navajo, SW NE SE 27-31n-17w. Dry. TD 8,033 ft. Molas 7,801 ft.

WEST TEXAS

Andrews County: Western Drilling Co. and Tobe Foster 1 W. Crenshaw, 8-A46-PSL. Dry. TD 4,605 ft. in San Andres.

Borden County: Goldston Oil Corp. 1 De-Loaches & Rodgers, 25-32-T2N-T&P. Dry. TD 7,960 ft. in Canyon.

Coke County: Allen Guiberson 1 D. D. Feldman, 301-1A-H&TC. Dry. TD 6,667 ft. in Caddo lime.

Laan-Tex Oil Co. 1 J. L. Reid, Sec. 7, J. P. Angle Sur. Dry. TD 6,812 ft.

Crockett County: Wilson & Mitchell 1 University, 3-47-University. Dry. TD 390 ft.

Gaines County: O. D. Alsabrook 1-A Coline Oil Corp., 93-4-D&WRR. Dry. TD 5,210 ft. in dolomite.

* Carl J. Westlund 1 Eugene Sherrod, 19-A23-PSL. IP 214 BOPD 1-in., 32°, Clear Fork 6,370-6,410 ft. TD 6,502 ft. Extension.

Kent County: Drilling & Exploration Co. 1-B Wilson Connell, 20-5-H&GN. Dry. TD 7,750 ft. in Pennsylvanian.

* Reagan County: The Texas Co. 1-AC State, 9-11-University. IP 273 BOPD, 18/64-in., 49°, Ellenburger 9,410-9,500 ft. TD 9,742 ft. New field.

Sutton County: N. B. Hunt 1 Lea Allison, 41-B-HE&WT. Dry. TD 5,291 ft. in Strawn.

Terrell County: Fred Turner Jr. 1 Kennie Noelke, 6-A2-TCRR. Dry. TD 2,656 ft.

*Upton County: Gulf Oil Co. 1 McElroy Ranch Co., 182-E-CCSD&RGNG. IP 403 BOPD, ¼-in., Devonian 10,490-600 ft. TD 12,762 ft. in Ellenburger. New field.

ILLINOIS

Clinton County: Schiermann & Imming 1 Anna Reichert, SE NE SE 14-1n-4w. Dry. TD 1,107 ft.

"It's oil, old man--LANE-WELLS, y'know"

T. Hadallet 1 L. Regan, SE SW NE 7-2n-2w. Dry. TD 1,378 ft.
Montgomery County: E. L. Wirth 1 Kerr, SW SW SW 22-10n-4w. Dry. TD 620 ft.
L. Marsch 1 A. Doyle, SE SE SE 21-10n-4w. Dry. TD 629 ft.
Randolph County: M. L. Vance 1 Bauer Bros. NW SW SW 1-4s-6w. Dry. TD 2,176 ft. Devonian 2,038 ft.
Eastern Petroleum Co. 1 J. Schulze, SW SE NW 2-7s-6w. Dry. TD 707 ft.
St. Clair County: W. G. Grossman 1 Mueller-Miller, SE NE NE 30-1s-8w. Dry. TD 1,530 ft. Trenton 1,448 ft.

INDIANA

Gibson County: Coy Oil Co. 1 Morrison-Garwood, 10-1s-10w. Dry. TD 2,048 ft. McClosky 1,992 ft.
V. and I. Wirth 1 Arburn, SW SE SW 6-2s-8w. Dry. TD 1,527 ft. McClosky 1,520 ft.
R. H. Farrar 1 Redman-Scott, NE SE SW 28-3s-12w. Dry. TD 2,823 ft. McClosky 2,769 ft.
Posey County: Noah Petroleum Co. 1 Flowers, NE NE SW 27-4s-13w. Dry. TD 3,010 ft. Cypress 2,580 ft.
Calvert Drilling Co. 1 Shieba-Seibert, SE NE SW 32-6s-13w. Dry. TD 3,078 ft. Renoir 2,790 ft.
Spencer County: Joe Simpkins 1 Bretz, NE SE SW 3-7s-6w. Dry. TD 953 ft.
Sullivan County: B. Hackbush 1 Webster, SE SE SE 23-9n-10w. Dry. TD 2,363 ft. Devonian 2,338 ft.
Vigo County: C. B. Mansfield 1 Thompson, SE SW SW 23-11n-8w. Dry. TD 1,725 ft. Riley field extension.

WILDCAT COMPLETIONS

WESTERN KENTUCKY

Breckenridge County: P. J. Patton 1 Daugherty, SW SE SE 10-O-35. Dry. TD 771 ft.

MICHIGAN

Arenac County: William B. Stewart & Basin Oil Co. 1 Merkil et al, SW NW SW 29-20n-3e. Dry. TD 3,074 ft. in Dundee.
Genesee County: O. H. ONeal 1 Malone, SW SW SW 33-9n-5e. Dry. TD 2,792 ft. in Dundee.
Kalkaska County: W. H. Strickler 1 State-Clearwater, NE SW NE 27-27n-5w. Dry. TD 2,880 ft. in Dundee.

(Continued on page 174)

Four-Color Wall Maps

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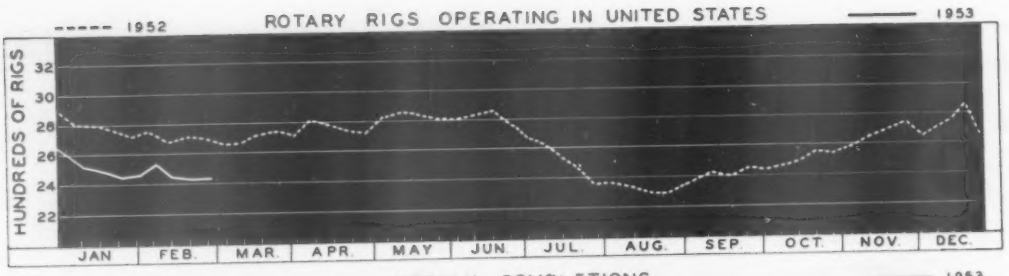
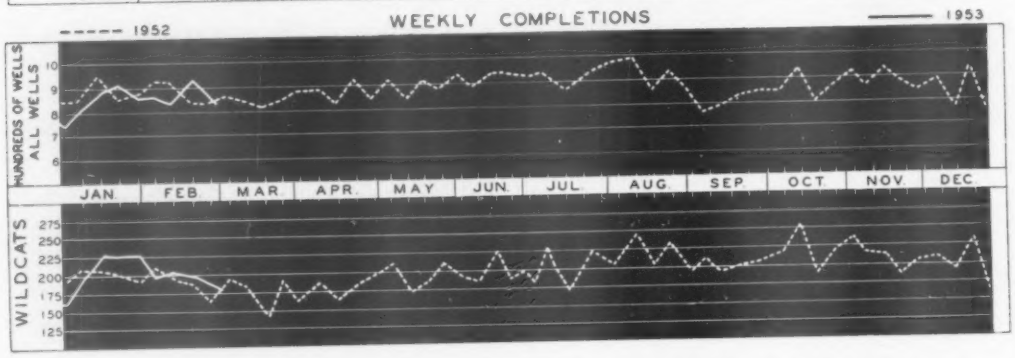




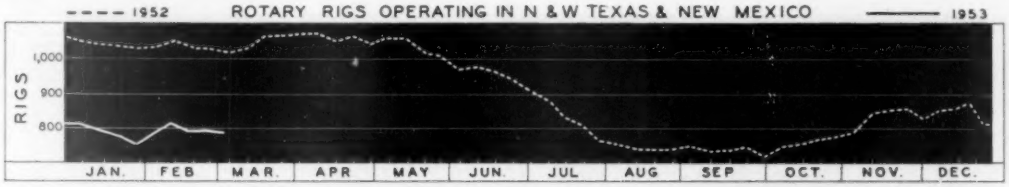
CURRENT STATISTICS

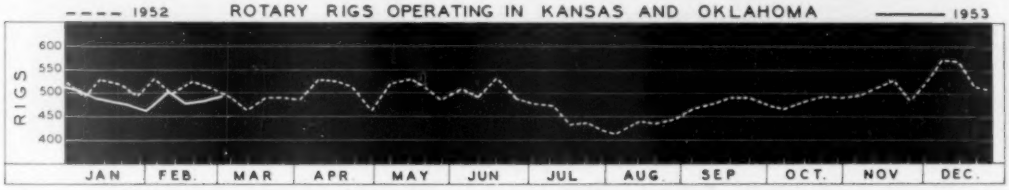
EXPLORATION

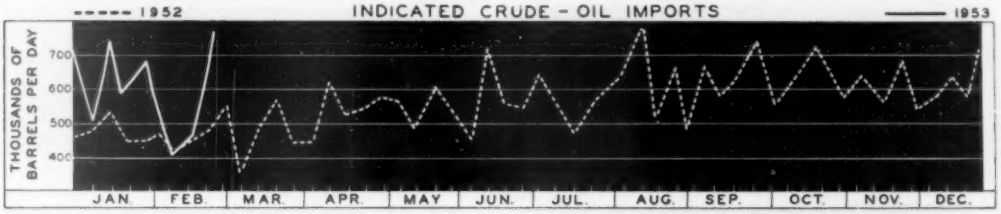
WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 28, 1953

	Total of all wells					Feb. 28		Wildcat completions and discoveries					Cumulative total, 1953				
	Comp.	Oil	Gas	Dry	Footage	1953	1952	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	11	5	0	*6	15,700	104	109	0	0	0	0	0	0	0	0	0	0
Pennsylvania	29	13	3	†13	40,802	263	266	0	0	0	0	0	0	0	2	5	7
West Virginia	10	2	5	3	24,876	90	106	0	0	0	1	1	0	0	0	1	1
Ohio	9	0	2	‡7	17,961	145	153	0	0	0	0	0	1	0	0	3	4
Indiana	20	7	0	13	37,354	207	183	0	0	0	8	8	5	0	1	45	51
Kentucky	19	8	4	7	44,350	171	217	0	0	0	1	1	4	0	1	28	33
Illinois	35	10	0	25	78,859	314	252	0	0	0	7	7	1	0	0	56	57
Michigan	11	2	0	9	34,633	97	93	0	0	0	6	6	5	0	1	37	43
Kansas	86	32	8	§46	293,009	721	817	2	0	4	16	22	19	0	7	126	152
Nebraska	2	1	0	1	11,945	44	41	1	0	0	0	1	4	0	0	19	23
Oklahoma	132	89	1	‡42	496,591	1,058	1,018	0	1	0	8	9	12	3	5	98	118
Texas	309	173	17	119	1,334,619	2,567	3,081	16	1	2	61	80	142	16	25	656	839
N. Central (Dist. 7-B & 9)	113	62	1	§50	366,828	902	958	9	0	0	26	35	76	0	4	269	349
West (Dist. 7-C & 8)	60	45	0	15	299,864	567	965	3	0	0	9	12	21	1	0	109	131
Panhandle (Dist. 10)	15	4	10	1	47,223	130	117	0	0	0	0	0	0	2	0	6	8
Eastern (Dist. 5 & 6)	16	4	1	11	74,893	116	133	0	0	0	8	8	4	0	0	43	47
Gulf Coast (Dist. 2 & 3)	34	17	2	15	218,850	388	465	1	1	0	2	4	23	3	7	93	126
Southwest (Dist. 1 & 4)	71	41	3	27	326,961	464	443	3	0	2	16	21	18	10	14	136	178
Louisiana	45	28	3	14	355,150	434	386	0	0	0	3	3	10	1	5	56	72
Northern	17	10	1	6	60,777	186	210	0	0	0	1	1	1	0	0	23	24
Southern	28	18	2	8	294,373	248	176	0	0	0	2	2	9	1	5	33	48
Arkansas	9	6	0	3	40,829	71	67	1	0	0	1	2	4	0	0	14	18
Mississippi	4	1	0	3	26,949	67	78	0	0	0	3	3	5	0	0	31	36
Southeastern States	5	1	0	4	23,985	27	9	0	0	0	3	3	1	0	0	21	22
Montana	11	6	0	5	54,003	64	19	0	0	0	3	3	1	0	0	14	15
Wyoming	6	3	0	3	38,897	90	89	0	0	0	1	1	1	0	0	23	24
Colorado	3	0	0	3	15,931	81	72	0	0	0	3	3	2	0	1	47	50
Utah	0	0	0	0	0	11	9	0	0	0	0	0	1	0	0	8	9
New Mexico	18	10	3	5	125,432	190	141	1	0	2	3	6	4	0	3	25	32
California	57	38	1	18	311,321	395	411	3	0	0	17	20	7	0	1	94	102
North Dakota	5	5	0	0	42,542	42	1	0	0	0	0	0	0	0	0	10	10
Miscellaneous	0	0	0	0	0	7	14	0	0	0	0	0	0	0	0	5	5
Total United States	836	440	47	349	3,465,738	7,260	¶7,632	24	2	8	145	179	229	20	52	1,422	1,723
Total previous week	936	479	77	380	3,831,261			25	0	4	168	197	205	18	44	1,277	1,544
Total March 1, 1952	869	465	51	353	3,529,391			31	1	6	158	196	229	15	42	1,401	1,687

Service wells included: *6, †11, ‡2, §1. ¶Revised.



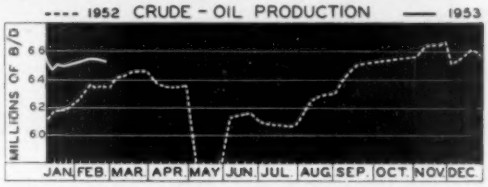


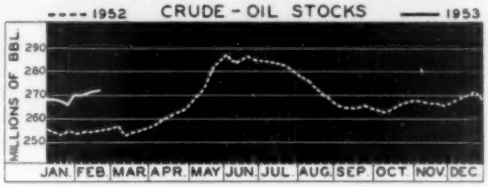


DAILY AVERAGE PRODUCTION FOR WEEK

	February 28			Feb. 21
	Crude oil	Lease condensate	Total	total
Alabama	4,200		4,200	4,100
Arkansas	77,750	650	78,400	79,000
California	989,800		989,800	989,100
Colorado	89,100		89,100	88,900
Eastern	54,400		54,400	54,400
Florida	1,475		1,475	1,550
Illinois	167,200		167,200	165,000
Indiana	33,700		33,700	33,700
Kansas	322,700		322,700	340,500
Kentucky	29,100		29,100	30,000
Louisiana	663,700	38,600	702,300	702,450
North	115,050	2,600	117,650	117,800
South	548,650	36,000	584,650	584,650
Michigan	35,800		35,800	35,300
Mississippi	91,850	4,750	96,600	96,700
Montana	30,000		30,000	31,000
Nebraska	12,400		12,400	12,900
New Mexico	178,625	625	179,250	179,150
Oklahoma	539,900		539,900	537,600
Texas	2,889,525	50,425	2,939,950	2,939,950
Dist. 1	36,500	250	36,750	36,750
Dist. 2	161,475	6,000	167,475	167,475
Dist. 3	471,750	25,700	497,450	497,450
Dist. 4	261,100	6,000	267,100	267,100
Dist. 5	51,850	400	52,250	52,250
Dist. 6	125,900	6,000	131,900	131,900
East Texas field	259,900		259,900	259,900
Dist. 7-B	111,400	100	111,500	111,500
Dist. 7-C	174,050	5,100	179,150	179,150
Dist. 8	971,800	350	972,150	972,150
Dist. 9	187,800	500	188,300	188,300
Dist. 10	76,000	25	76,025	76,025
Utah	5,000		5,000	5,300
Wyoming	207,500		207,500	212,000
North Dakota	11,000		11,000	11,600
Total U. S.	6,434,725	95,050	6,529,775	6,550,200
Change from previous week, down			20,425	
Canada	169,750		169,750	176,850
Total U. S. production January 1-February 28			384,699,250 bbl.	
Same period last year (crude plus cond.)			*377,366,000 bbl.	

*Includes 5,645,395 bbl. condensate.



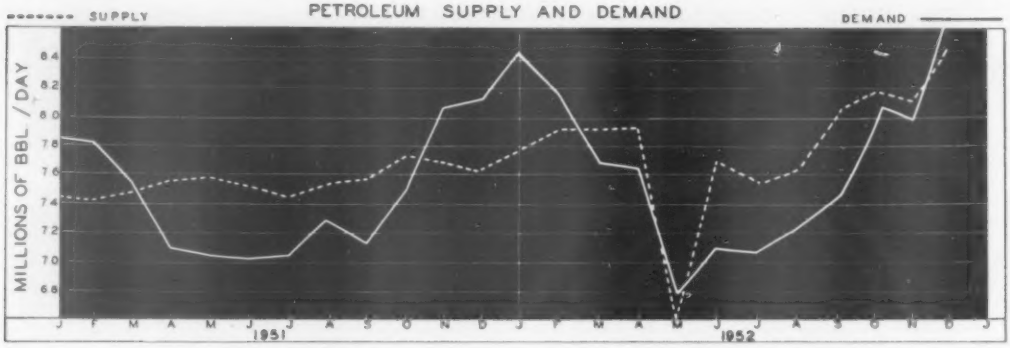


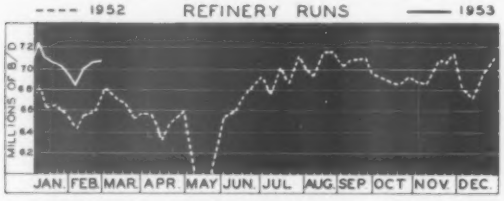
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

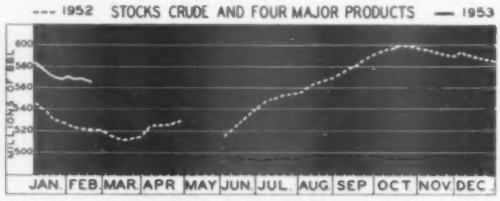
(Thousands of barrels)

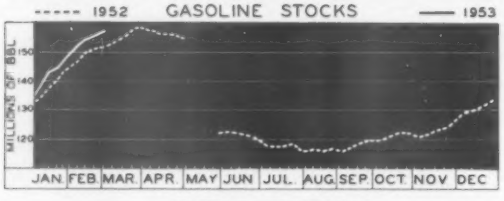
	Feb. 21, '53	Feb. 14, '53	Feb. 23, '52
Pennsylvania Grade	2,207	2,218	2,100
Other Appalachian	2,051	2,289	1,903
Illinois, Indiana, Michigan	9,873	10,151	10,559
Arkansas	3,033	2,917	2,844
Louisiana	16,117	16,257	13,941
North	2,770	2,430	2,630
Gulf	13,347	13,827	11,311
Mississippi	3,569	3,425	3,384
New Mexico	7,681	7,758	7,636
Oklahoma and Kansas	35,835	36,891	40,008
Texas	135,878	134,644	121,523
East Texas proper	11,255	11,040	10,941
West Texas	64,786	64,477	55,461
Texas Gulf	25,670	25,679	24,973
Other Texas	34,167	33,448	30,148
Rocky Mountain	16,159	15,681	13,862
California	32,401	32,872	30,919
Foreign	7,577	6,783	6,505
Total	272,381	271,886	255,184

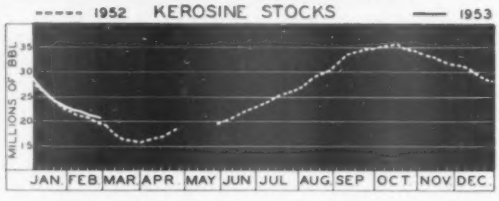
*Bureau of Mines.

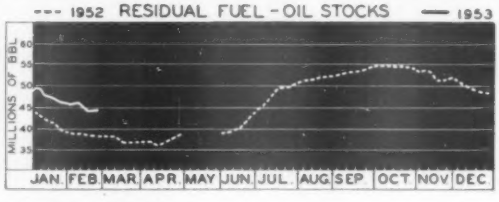










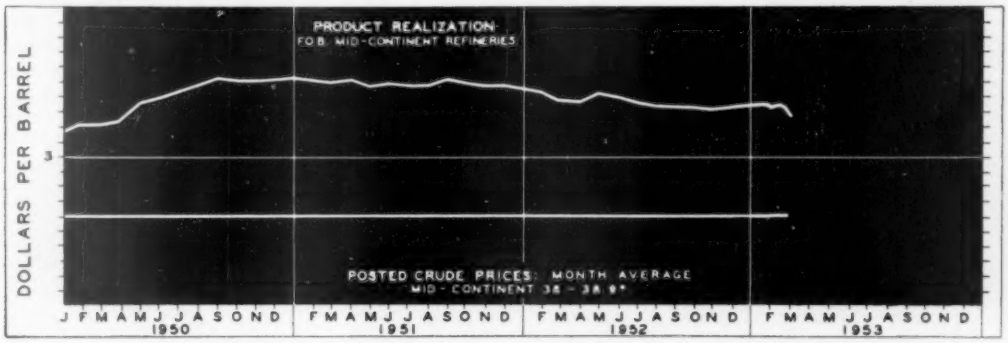


A.P.I. REFINERY REPORT, FEBRUARY 28

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1952 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,036	421.0	56.7	302.4	228.6	35,171	9,151	24,650	11,543	973	383.9	41.5	252.4	245.5
Appalachian:														
District 1	104	40.8	6.3	17.6	14.6	4,339	494	1,187	623	109	45.1	4.7	19.3	15.0
District 2	92	48.0	6.4	18.4	16.9	1,792	296	486	189	82	39.1	5.1	14.0	20.2
Ind., Ill., Ky.	1,294	680.4	89.8	240.4	185.8	36,507	4,633	10,588	4,417	1,252	664.9	84.4	232.8	196.9
Okla., Kans., Mo.	574	336.6	17.4	122.7	56.4	17,451	1,101	7,637	1,124	556	310.6	13.6	134.5	68.4
Inland Texas	281	180.0	11.0	44.9	36.1	6,487	312	1,210	886	251	176.1	15.2	40.2	41.2
Texas Gulf Coast	1,800	776.6	144.6	439.6	265.0	21,415	2,270	6,923	6,116	1,645	740.0	137.9	421.3	255.8
La. Gulf Coast	531	265.4	68.9	126.3	70.4	7,706	1,128	3,289	1,592	530	214.6	49.0	154.8	60.3
N. La. and Ark.	87	32.8	8.7	26.7	6.6	3,400	480	1,248	83	79	35.5	7.2	20.4	6.8
Rocky Mountain:														
New Mexico	18	11.6		2.9	3.9	165		34	31	17	10.6	0.5	2.5	3.9
Other Rocky Mtn.	237	115.6	5.6	48.4	43.8	6,663	323	1,540	974	217	99.2	6.9	48.8	47.7
California	1,036	428.3	3.9	152.0	360.0	16,282	362	9,233	16,854	962	389.5	4.4	187.1	360.8
Feb. 28, 1953	7,090	3,337.1	419.3	1,542.3	1,288.1	157,378	20,550	68,025	44,432	6,673	3,109.1	370.4	1,528.1	1,322.5
Feb. 21, 1953	7,079	3,446.1	437.9	1,553.0	1,301.9	155,857	21,357	71,506	44,364					
Mar. 1, 1952	6,816	3,183.0	337.0	1,581.7	1,386.3	152,073	18,536	56,588	37,740					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
POSTED CRUDE PRICES: MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1950
F M A M J J A S O N D
1951
F M A M J J A S O N D
1952
F M A M J J A S O N D
1953

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.27 for week ended February 21, $3.32 for previous week, and $3.42 for February 1952. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of March 4, 1953. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅛-10½	12.125-12.75	10¾-11
Premium gasoline, 86-88 octane	11¼-11½	13.25-14.0	11¾-12
42-44 w.w. kerosine	8½-9	10.40-10.65	9
No. 2 straw fuel oil	7½-8	9.50-9.65	8
No. 6 residual	$0.85-1.00	$1.90-2.15	$1.50-1.65

NATURAL GASOLINE

	Group 3	North Tex.	N. La.
Grade 26-70	5½	5	5¼
Grade 18-55	6.60	6.10	6.35

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	12-13
750 vis., No. 3-4 neutral	15-16
2,000 No. 5-6 neutral	17-18

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	21-22
200 vis., No. 3 neutral, 0-10 pp.	12-13

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	27.5
180 vis., 0 p.t. neutral	29.5

WAX
Mid-Continent

132-134 A.M.P.	5.5

SOME of the pressure is off heating distillates at pipe-line terminals in the North Central states. Colder weather in the area has increased shipments out of terminals, and since most of the heating season has passed, Mid-Continent suppliers will replace the terminals stocks only at points where it is certain to move by the end of March. However, the better stock position at pipeline terminals has not changed the price picture in the Mid-Continent.

Restriction on size of pipe-line tenders may cause a slight increase in tank-car shipments of distillate since suppliers will not want to run the risk of demurrage at pipe-line terminals on tenders of distillates made near the end of the season.

Reports that at least one or two Mid-Continent refiners have made contracts with utility companies for delivery of residual fuel to steam plants at prices guaranteed to be competitive with coal seem to indicate that these suppliers at least feel that prices of heavy fuel on the Group 3 market will remain at the $1.00-or-lower level for some time. Most of these contracts are reported to be with utility companies in Kansas or in adjoining states and near the Kansas border.

The number of marketers following the pattern of tank-wagon price increases, set by Socony-Vacuum Oil Co., Inc., for gasoline in New York and New England had grown to seven during the first 3 days of March. Atlantic Refining Co. announced increases for New England but did not raise prices in Pennsylvania. Esso Standard Oil Co. announced early in the week that it had no plans for a general price increase in its marketing area, but that some adjustments probably would be made to correct abnormal prices in certain sections.

Tank-wagon increases by Socony averaged about 0.5 cent a gallon, but many dealers have raised their margins by an additional 0.5 cent for a net increase of 1.0 cent to consumers.

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif‡	Okla. homa, Kansas	Gulf Coast Tex.*	West Tex.†
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.25	....	$2.12
21-21.9	2.30	2.27	....	2.14
22-22.9	2.37	2.29	....	2.16
23-23.9	2.45	2.31	....	2.18
24-24.9	2.53	2.33	$2.56	2.20
25-25.9	2.61	2.35	2.58	2.22
26-26.9	2.69	2.37	2.60	2.24
27-27.9	2.76	2.39	2.62	2.26
28-28.9	2.83	2.41	2.64	2.28
29-29.9	2.91	2.43	2.66	2.30
30-30.9	2.97	2.45	2.68	2.32
31-31.9	3.04	2.47	2.70	2.34
32-32.9	3.12	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico.

Last general price change represented a 50-cent increase, effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Beauregard Parish	2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.40
Southwest Pennsylvania	3.97
West Virginia	39.1
Illinois Basin	2.77

WILDCAT COMPLETIONS

(Continued from page 169)

Livingston County: Brazos Oil & Gas Co. JK-1 State-Green Oak, C W½ SW NE NW 11-1n-6e. Dry. TD 3,885 ft. in Niagaran.

Newaygo County: Max Spidel 1 Linkham, NW NE NW 34-14n-14w. Dry. TD 2,304 ft. in Traverse.

Oceana County: Max Spidel 1 Russell, SW SW SE 35-14n-18w. Dry. TD 1,785 ft. in Traverse.

WEST VIRGINIA

Randolph County: Middle Fork district: Seneca Gas & Oil 1, West Virginia, Coal & Coke Corp., Sheffy tract, elevation 2,564 ft. Dry. TD 4,201 ft.: Benson sand, 3,715-3,745 ft.

SOUTH LOUISIANA

Evangeline Parish: The Texas Co. 1 Young, 18-5s-1w. Dry. TD 12,056 ft.

St. Landry Parish: Magnolia Petroleum Co. 1 Sylvester, 139-5s-3e. Dry. TD 11,069 ft.

NORTH LOUISIANA

De Soto Parish: Lee Spencer 2 Porter Est. "A," C SW SE 23-12n-13w. Dry. TD 1,400 ft.

ARKANSAS

Columbia County: C. V. Lisman et al 1 Peter Todd, C SW NE SE 5-16s-18w. Dry. TD 4,020 ft.

* Hunt Oil Co. 2 Dennis, 11-20s-23w. IPF 183 BOPD, 44°, open, Hill sand 5,025-35, 5,052-58, 5,069-78 ft. TD 5,984 ft. (New pay in Springhill pool.)

OKLAHOMA

Carter County: Sooner State Oil Co. 1 Pierson, SE SE NE 6-3s-2e. Dry. TD 3,609 ft.

Jackson County: Falcon Seaboard Drilling Co. 1 Moreau, C NW SE 4-1n-21w. Dry. TD 5,956 ft. Viola 5,933 ft.

Lincoln County: Mid-Continent Petroleum Corp. and Oklahoma Natural Gas Co. 1 Brixey, NE NE NE 9-15n-4e. Dry. TD 4,054 ft.

Marshall County: Pure Oil Co. et al 1 Rowland unit, SE SE SW 31-7s-5e. Dry. TD 11,705 ft.

McCurtain County: Renshaw Bros. 1 Edwards, W½ SW SW NW 4-8s-23e. Dry. TD 400 ft.

Osage County: Porter Oil & Gas Co. 1 Osage, SE SW NE 25-24n-3e. Dry. TD 3,900 ft.

Pawnee County: Mid-Continent Petroleum Corp. and Sunray Oil Corp. 1 Buntin, NW SW SW 30-20n-5e. Dry. TD 3,936 ft.

* Pottawatomie County: T. T. Eason 1 Anderson estate, NE SE SW 3-11n-2e. IPF 703 BOPD and 9,000 M.c.f. of gas per day, Misener 5,568-74 ft. TD 5,695 ft.

Stephens County: E. Dunlap, Jr. and Geo. E. Cameron, Jr. 1 Johnson, NW NE NW 12-2s-9w. Dry. TD 3,804 ft.

KANSAS

Barber County: Hanco 1 McKeever, NW NE NW 7-32s-10w. Dry. TD 4,920 ft.

* Isern 1 Skinner, NE SW NE 1-32s-15w. IP 2,100 M.c.f. of gas daily, Douglas 4,082-94 ft. TD 5,107 ft. (Opens Skinner Southwest pool.)

Butler County: Rex & Morris 1 Bosenitz, NE NE SE 20-23s-5e. Dry. TD 2,476 ft.

Rex & Morris-Sheehan 1 Frerking, SE SE NE 4-24s-5e. Dry. TD 2,565 ft.

Cowley County: McNeish & Gralaap 1 Collinson "C," SW SW NW 21-33s-4e. Dry. TD 3,193 ft.

White & Ellis 1 Fishback, NE NE SE 28-34s-3e. Dry. TD 3,435 ft.

Marion County: W. R. Wilson et al 1 Balzer, SE NW NE 21-19s-3e. Dry. TD 2,890 ft.

Morris County: Continental Oil Co. 1 Anderson, NW NE NW 17-14s-7e. Dry. TD 2,856 ft.

* Morton County: Cities Service Oil Co. 1 Smith "O," NW NW SE 20-33s-42w. IP 25,400 M.c.f. gas daily, Topeka 2,906-72 ft., Lansing-Kansas City 3,069-3,222 ft. TD 3,470 ft.

* Cities Service 1 Kepner, NE NE NW 23-33s-42w. IP 9,000 M.c.f. gas daily, Morrow 4,534-44, 4,782-4,804, 4,818-30 ft. TD 5,165 ft.

* Cities Service 1 Harmon "A," NW NW SE 13-33s-43w. IP 27,290 M.c.f. gas daily, Topeka 2,884-3,210 ft., Lansing-Kansas City 3,132 ft. TD 3,434 ft.

Ness County: T. Palmer 1 Ryan, SW SW SW 23-16s-21w. Dry. TD 4,427 ft.

Osborne County: Anderson-Prichard 1 Delaney, N WSW NE 29-6s-15w. Dry. TD 4,010 ft.

* Pratt County: W. J. Coppinger 1 Fitzsimmons, SE SE NW 30-27s-13w. IPF 1,052 BOPD, Lansing-Kansas City 4,056-80 ft. TD 4,561 ft. (Opens Fitzsimmons pool.)

Cities Service Oil Co. 1 Luther D, SE SE SW 15-29s-14w. Dry. TD 4,920 ft.

* Rooks County: Champlin 2 Brungardt "A," NW NW SW 36-10s-17w. IPP 45 BOPD, Arbuckle 3,219-25 ft. TD 3,642 ft. (New pay at Brungardt pool.)

Reserve Drilling Co. 1 Armbrister, NE NE NW 33-10s-19w. Dry. TD 3,796 ft.

Rush County: Morrison 1 Alberts, NE NE NE 28-17s-19w. Dry. TD 4,030 ft.

Russell County: Isern 1 Bosch, SE SE NW 8-15s-15w. Dry. TD 3,392 ft.

Sumner County: Herndon 1 Schmidt, SE NE SE 30-33s-2w. Dry. TD 4,675 ft.

Time 1 Werneke, NE NE SE 36-34s-2w. Dry. TD 4,675 ft.

Woodson County: Emery Construction 1 Pringle, NW NW SE 13-26s-15e. Dry. TD 1,315 ft.

NEBRASKA

* Kimball County: H. J. Williams 1 Allely, SW SW NW 1-12n-55w. IPP 146 BOPD, "J" sand 6,194 ft. TD 6,233 ft.

CALIFORNIA

Fresno County: Superior Oil Co. 57-29 Weber, 29-15s-17e. Dry. TD 7,335 ft.

Kern County: Ferguson & Bosworth 1 Williams, 27-32s-29e. Dry. TD 2,097 ft. in Santa Margarita.

O. F. Catalano & T. W. Stansbury 16-8 Drury, 8-30s-29e. Dry. TD 3,201 ft. in Jeppi Zone.

D. Frankel 1 Henry C Levi, 4-30s-29e. Dry. TD 4,980 ft.

Honolulu Oil Corp. 22P "6," 6-32s-24e. Dry. TD 4,480 ft.

Stansbury-Webb 21A-28 KCL, 28-29s-27e. Dry. TD 4,372 ft.

Humble Oil & Refining Co. 12 KCL C, 10-29s-26e. Dry. TD 7,758 ft.

Elko Drilling Co. 1 Elko-Strode, 15-25s-18e. Dry. TD 2,075 ft.

Ferguson & Bosworth 1 USL, 8-30s-21e. Dry. TD 3,946 ft.

* Kings County: Brookline Oil Co. 1 Travma, SW SW 8-24s-18e. IPP 17 BOPD, 17°, cut 75 per cent, perforations 1,545-50 ft., TD 4,012 ft. New Temblor sand pool ½ mile north of Pyramid Hills field.

Los Angeles County: L. A. Hanson, Sr. 1 Assoc. Telephone, 32-2s-11w. Dry. TD 4,825 ft.

San Benito County: Monterey Oil & Gas Exploration 2 Grant, 6-12s-6e. Dry. TD 2,781 ft.

San Luis Obispo County: C. R. North 3 J. R. Davis, 10-28s-12e. Dry. TD 1,200 ft.

Sunray Oil Corp. 63-5 Sunray-G. P. Wreden, 5-29s-18e. Dry. TD 10,995 ft.

Santa Barbara County: Crawford & Hiles 1 Western-Hollister, 3-4n-29w. Dry. TD 1,590 ft.

Sutter County: Richfield Oil Corp. 1 Butte Community C, 28-16n-1e. Dry. TD 6,133 ft.

Ventura County: Reve Oil Co. 2 Adamson, 6-1n-20w. Dry. TD 548 ft.

* G. W. Phillips 1 Bailey, NE 12-4n-23w. IPP 10 BOPD, 21°, perforations 798-875 ft., TD 955 ft. New field discovery near Ojai.

* Terry Drilling Co. 2 Tapo, NW NE 13-3n-18w. IP 700 BOPD, 35°, perforations 2,370-2,507 ft. TD 3,755 ft. New Luisian sand (Miocene) discovery in Tapo Canyon area.

Yolo County: Humble Oil & Refining Co. 1 J. C. Maxwell et al, 7-7n-3e. Dry. TD 13,060 ft.

MONTANA

Hill County: Seaboard Oil Co. 1 Seaboard-Union-Dolezall, NE SW SW 21-35n-10e. Dry. TD 5,416 ft. Cambrian 5,387 ft.

Poplar County: Ajax Oil Co. 1 Paulson, C NW NW 4-31n-50e. Dry. TD 7,004 ft. Continental "D" zone 6,915 ft.

Toole County: Albermont-Tankel 1 Parker, C SW NE 17-37n-3w. Dry. TD 2,608 ft. Madison 2,582 ft.

WYOMING

Johnson County: Trigood Oil Co. 1 Dennis, SW NW NW 18-41n-77w. Dry. TD 9,141 ft. Tensleep 9,021 ft.

Natrona County: Sinclair Oil & Gas Co. C-2 East Salt Creek, SE NW SE 4-40n-78w. Dry. TD 6,018 ft. 2nd Wall Creek 4,972 ft.

Weston County: W. F. Lacy 1 Government, C SW SE 6-43n-64w. Dry. TD 5,776 ft. Newcastle 5,700 ft.

COLORADO

Adams County: Northern Petroleum 1 Wheldon, NW NE NE 24-2s-57w. Dry. TD 5,400 ft. "J" sand 5,400 ft.

Logan County: W. W. Harvey and M. D. Scruggs 1 Haley Smith Co., NW SW SW 7-11n-53w. Dry. TD 5,473 ft. "J" sand 5,400 ft.

Washington County: Triangle J Oil Co. 1 Blake, SE SW NW 12-2s-53w. Dry. TD 5,058 ft. Lakota 5,025 ft.

SASKATCHEWAN

Socony-Woodley-Southern 6-16/B North Tompkins, LSD 16, 6-14-21w3. Dry. TD 4,150 ft.

Calvan Charter Sapphire 8-15 Wilie, LSD 8, 15-40-20w3. Dry. TD 3,508 ft.

ALBERTA

* Stockton Socony 1 CPR, LSD 10, 22-28-20w4. IP 44,500 M.c.f. gas daily, Lower Cretaceous, TD 5,905 ft.

* Texaco 1-A Enchant, LSD 14, 23-13-17w4. Capped. Madison, TD 3,454 ft.

* Imperial 2-7 Atim, LSD 2, 7-54-26w4. Viking gas well, TD 3,397 ft.

* Imperial 2-26 Willingdon, LSD 2, 26-55-15w4. Viking gas, TD 2,853 ft.

Merrill-Mitmor 2-14 Amerada, LSD 2, 14-48-17w4. Dry. TD 4,450 ft.

Fork Lake 1, LSD 8, 19-63-10w4. Dry. TD 1,251 ft.

Shell 1 Jumping Pound CPR, LSD 7, 31-24-5w5. Dry. TD 11,179 ft.

Imperial Canadian Superior 8-28 Leo, LSD 8, 28-35-17w4. Dry. TD 6,631 ft.

Cities Service-Seaboard 1 Lobstick, LSD 11, 9-53-8w5. Dry. TD 8,370 ft.

Echo Falls 2-8, LSD 2, 8-58-4w4. Dry. TD 1,700 ft.

Richland 1 Ram River, LSD 1, 2-37-11w5. Dry. TD 4,591 ft.

EQUIPMENT MEN . . . in the News

Bethlehem Names New Sales And Service Assignments

R. O. BRANYON

New responsibilities in oil-field machinery sales and service for Bethlehem Supply Co. have been assumed by five machinery sales personnel whose promotions have been announced by Jack Graves, manager of machinery sales for the company.

Moving into the Southern California area from his post as machinery salesman out of Bakersfield, Calif., for Bethlehem is R. O. Branyon, who has been appointed machinery salesman, specializing in drilling equipment.

Handling new assignments in the San Joaquin Valley fields as machinery salesmen will be Walter Kropf and Paul Rohde. Kropf was formerly a general salesman and Rohde was service man, both at Bethlehem's Bakersfield store.

WALTER KROPF

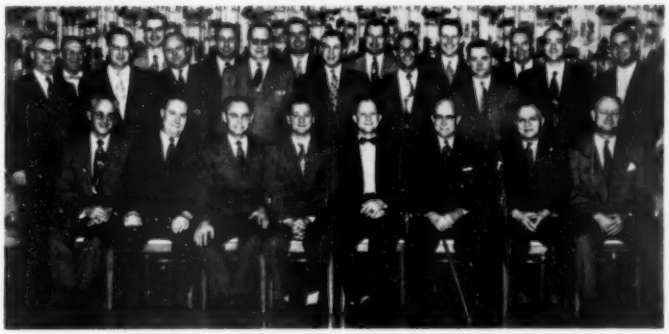
PAUL ROHDE

D. C. WESTFALL

KILPATRICK

Don C. Westfall has been moved into the Bethlehem Supply store at Ventura, Calif., handling machinery sales for the Castaic, Santa Maria, and San Ardo, Calif., areas. He was formerly parts sales supervisor in the Los Angeles office.

Taking over Westfall's past responsibilities of parts sales supervisor will be R. H. Kilpatrick, who has been with Bethlehem Supply since 1946.



Happy Co. Holds Annual Sales Meeting

Twenty-five district salesmen and engineers from the Happy Co. met in Tulsa recently for its annual sales meeting. Happy engineers explained latest improvements in the company line of pumping units, heat-transfer equipment, engine starters, belting and hose. According to Leo C. King, president, much time was devoted to discussing and solving problems confronting oil companies. Now in its thirty-fourth year, the firm has grown to six stores and four sales offices throughout the Mid-Continent area. Paul H. Mahaffey, present chairman of the board, founded the company.

Wagner Joins C-R-C As Houston Representative

W. E. WAGNER

William E. Wagner has joined C-R-C Supply Division as a representative in the Houston area, I. W. McKinney, division manager, has announced.

Wagner comes to C-R-C from Charles Wheatley Co., where he worked for 5½ years in the Tulsa and Houston areas.

C-R-C Supply, a division of Crutcher-Rolfs-Cummings, Inc., carries a complete line of fittings, valves, and hand tools.

Schlumberger Establishes Two Canadian Offices

Establishment of two division offices of Schlumberger Well Surveying Corp. in Canada under the supervision of the Calgary headquarters has been announced by W. J. Gillingham, executive vice president.

Formation of the Western and Eastern divisions was made necessary by greatly expanded activity in Canada during the past year, Gillingham said. The program has also included the opening in recent months of district offices in Camrose, Alta., and Kindersley and Virden, Sask.

R. C. Davis, who has been serving as district manager at Edmonton, Alta., will head the new Western division office. Davis, an employe of Schlumberger since 1937, served in the Texas and Mid-Continent areas before going to Canada in 1951. His headquarters will remain in Edmonton.

D. M. Cowart will be manager of the Eastern division with offices at Regina, Sask. Cowart was transferred to Canada from Shreveport. He was previously located for several years in Central and West Texas offices.

Security Appoints Scott Regional Sales Manager

C. C. SCOTT

Cecil C. Scott has been appointed central Mid-Continent regional sales manager for Security Engineering Co. by Otto Hammer, Security president. Scott will have charge of all Security sales in Texas, west of Abilene, as well as New Mexico, Colorado, Wyoming, and North Dakota territories.

Scott began with Security in 1946 as a sales engineer at Odessa, Tex. He was later transferred to Kermit, Tex.

The following year he was moved to fill the same capacity in the Hobbs, N. M., district. In 1950 Scott was promoted to the job of divisional manager at Odessa for the West Texas-New Mexico area.

HOMCO Announces Personnel Changes and Transfers

Houston Oil Field Material Co., Inc., has announced the following personnel changes and transfers: Ralph E. Brumley has been promoted from directional drilling engineer to assistant district superintendent of directional drilling, New Iberia, La.; W. T. Carroll from sales and service representative, Odessa, Tex., to district superintendent at Farmington, N. M.; H. H. Hughes from New Orleans to Houston as assistant general superintendent over the service division; and C. J. Erwin from Houma, La., to New Orleans as assistant division manager over the Louisiana and Mississippi division under Tom L. Holland.

Burley Q. McAdams has been transferred from string-shooting service at Houston to Farmington, N. M., in the same capacity; L. C. Schneider from string-shooting service at New Iberia to string-shooting service at Houma; H. E. White from fishing-tool supervisor at Houston to Victoria, Tex.; J. K. Young from fishing-tool supervisor at Victoria to Houston; Walter Harrison has been transferred from Houston to Corpus Christi, Tex., as division manager over Corpus Christi, Alice, and Edinburg, Tex., branches.

Rodney N. Baker has been made general field salesman of the Southwest Texas area, and R. H. McClendon has been appointed district superintendent over the Houma, La., area.

The following personnel have recently joined Homco: Albert F. Coleman, fishing-tool supervisor at Houston; Frank F. Ellis, fishing-tool supervisor at Casper, Wyo., and Curtis L. Johnson, directional drilling engineer at Houston.

Continental Supply and Associates Hold Dallas Sales Meet

Over 200 representatives of Continental Supply Co. and 12 of its associate manufacturers were in Dallas March 1-3 to attend the company's annual sales meeting.

With a theme of "Service," the meeting was held with group sessions at the Adolphus Hotel and new equipment demonstrations at the Emsco Manufacturing Co. D+B plant at nearby Garland, Tex.

After a group breakfast Monday morning, those attending went by chartered bus to the D+B plant, the morning being spent viewing demonstrations of new equipment, including the "vest pocket" Emsco rig GB-160; Gardner-Denver type FK-FXK mud pump, and an Emsco unit pumper with a CACO pumping engine completing the unit.

Group meetings were held Monday afternoon and Tuesday's sessions were rotated among the associated manufacturing companies represented, including The Youngstown Sheet & Tube Co.; Emsco Manufacturing Co.; Gardner-Denver Co.; Broderick & Bascom Rope Co.; Chain Belt Co.; Clayton Mark & Co.; Climax Engine & Pump Manufacturing Co.; Ladish Co.; The Lunkenheimer Co.; New York Belting & Packing Co.; Rockwell Manufacturing Co., and Technical Oil Tool Corp., Ltd.

Shown by the new Emsco Rig GB-160: W. D. Craig, Continental's Rocky Mountain district manager; J. H. Berry, managing director, Continental Supply Co., Ltd., Calgary, Canada; R. Hortenstine, Jr., South Texas and South Louisiana division manager; R. L. Collier, West and North Texas and New Mexico division manager; W. T. Powell, president, Emsco Manufacturing Co.; N. A. Endicott, Continental's vice president in charge of Gulf Coast division; R. A. Brewer, Kansas-Oklahoma division manager, and E. N. Wood, Continental's division manager with headquarters in Shreveport.

Viewing Gardner-Denver's type FK-FXK mud pump are (left): J. Allen Whitesides, manager Continental's drilling equipment division; Neal Harris, Continental district manager of machinery sales, Tulsa; G. V. Leece, vice president, Gardner-Denver; R. J. Bauer, district manager, Gardner-Denver; D. O. Meek, chief engineer, Gardner-Denver; F. I. Brinegar, executive vice president, Continental; R. P. Hechenkamp, and E. F. Schaefer, president, both of Gardner-Denver. Right: D. M. Bailey, Continental vice president; Otis Tubbs, manager of Continental's production equipment division; J. A. Savage, director and general manager, Emsco Engineering Co., Ltd., St. Albens, England; Julio Zumeta, executive manager of exports, Continental Supply, New York, and J. M. Leitch, manager of Continental's London office.

BS&B Names Siver General Manager of Engineering

C. A. SIVER

Black, Sivalls & Bryson, Inc., Kansas City, has announced the appointment of Chester A. Siver as general manager of engineering. Siver will have company-wide supervision of engineering activities including engineering staffs in Kansas City, Oklahoma City, and Tulsa.

Before joining BS&B, Siver was manager of engineering, Liquid Carbonic Corp., Durable Goods Division, Chicago. He formerly was associated with American Machine & Foundry, and Linde Air Products Co.

Siver will headquarter at the Kansas City general offices. He will be assisted by W. W. Pyeatt, administrative assistant; C. W. Hayes, chief engineer, Oklahoma City; Harold Manual, chief engineer, Kansas City, and Al Hanssen, chief engineer, Tulsa.

Owens, Long Appointed By T. D. Williamson, Inc.

T. D. Williamson, Inc., has announced the appointment of E. O. (Steve) Owens and Don L. Long as sales and service engineers.

E. O. OWENS

D. L. LONG

Owens graduated from Oklahoma A. & M. College in 1938. Since that time he has been employed in corrosion engineering and cathodic-protection capacities with the Bureau of Mines, Cities Service Gas Co., Huddleston Engineering and Brance-Krachy Co. Owens has been assigned the states of Oklahoma, Arkansas, Missouri, Kansas and the eastern half of Nebraska.

Long, a graduate of Oklahoma University in civil engineering, was employed by Mid-Continent Pipe Line Co. during 1949-50. He spent 1 year with Blaw-Knox as a design engineer in the chemical plant division in Tulsa, and was recently employed by Williams Bros. Co. as a construction engineer. Long's territory covers miscellaneous states.

Lane-Wells Executive, Key Personnel Meet in Los Angeles

Lane-Wells Co. executives met recently in Los Angeles with supervisory personnel from the company's head office and manufacturing departments to discuss progress in the firm's operations. On hand for the event were division managers from Houston, Oklahoma City, and Paramount, Calif.

Thomas to Handle Shortstir Mixers in Four-State Area

Morvin Thomas, of Morvin Thomas Co., Tulsa, has been named representative for Shortstir side-entering mixers in the Oklahoma, Texas Panhandle-Southern Kansas, and Western Arkansas areas.

Shortstir mixers, manufactured by the Sawyer-Jensen-Ross Co. of Tulsa, are designed for pipe-line, refinery and process industry heavy-duty mixing.

Wilson & Johnstone, Ltd. Named By S. C. Carter Co.

S. C. Carter Co., Inc., Los Angeles, manufacturers of the Carter long-stroke hydraulic pumping unit, has announced the appointment of Wilson & Johnstone, Ltd., as distributors for Trinidad and Tobago, British West Indies. Wilson & Johnstone will handle sales and service of the Carter units from its headquarters at Port of Spain.

Carter hydraulic pumping unit operating in Guapo, Trinidad, B.W.I. A. R. Wilson, of Wilson & Johnstone, Ltd., distributors of the Carter unit, is standing beside the unit.

Williams Joins Flint Steel As Manager, Warehouse Sales

H. N. WILLIAMS

Harry N. Williams has been made manager of warehouse sales for Flint Steel Corp. of Tulsa, according to an announcement by Harold G. Lewis, president and general manager.

Williams replaces Homer Hofflander who recently resigned. Williams comes to Flint Steel from Marsh Steel Corp., Kansas City, Mo., where he was sales manager from 1945 until the present time. Previously he had served as a district sales representative of Youngstown Sheet & Tube Co., and has had 7 years' experience with Wheeling Steel Corp.

Boughner Made Sales Engineer for Sealol Corp.

R. E. Boughner has recently become sales engineer for Sealol Corp., Providence, R. I., in the southwest territory including Kansas, Oklahoma, Louisiana, Arkansas, Texas, and Missouri with the exception of St. Louis. The company is engaged in introducing stuffing-box seal pump equipment which would be used by refineries and pipe lines.

Hess Elected Chairman of Thermoplastic Pipe Div.

W. L. Hess, vice president of Anesite Co., Chicago, has been elected chairman of the Thermoplastic Pipe Division of the Society of the Plastics Industry. This division is currently setting up standards for the industry in the manufacture of extruded plastic pipe.

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Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EQUIPMENT FOR SALE

87' Lee C. Moore Cantilever Derrick located East Central Oklahoma. Drilled one well since complete overhaul by Lee C. Moore. 41½' substructure, steel floor, 4' drop wings. $8,000.00. Box G-329, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Two hydraulic casing pulling units, in good condition with two tool houses and two late model pick-up trucks. Pipe Pulling, Inc., 629 West Broadway, Phone 475, Stafford, Kansas.

Deluxe custom built 34 foot hacienda office trailer. Tandem, 3 offices, 3 built-in desks, drafting and light table, plywood paneling, air conditioner, stove, closets and map cabinets.

$5,500

5115 Westheimer,
Houston, Texas
MO-3461

CASING

7" OD 26# Grade J55 Youngstown Range 3 with Hydril Speedite Threads. Streamline, 5300 feet, located Magnolia, Arkansas. Condition like new. Price $2.25 per ft. F.O.B. Magnolia.

SAM SIEGEL
Ph. 4-6512, Shreveport, Louisiana.

FOR SALE

Complete National 100 Rig including 3 PTD-6 Superior Diesel Engines with dual fuel equipment, 136' Lee C. Moore Mast with 8' substructure, 2 C-350 Ideal Power Pumps, Ideal Type 548 TC Traveling Block, Type R3 Swivel, and Type MS-20½ Rotary Table. Excellent condition, priced reasonable, located in Montana. Complete inventory upon request.

Box G-341

The Oil and Gas Journal,
Tulsa, Oklahoma

24" LINE PIPE Available For Immediate Shipment

Gas Pipeline company has available for sale approximately 15 miles of 24" O.D. new .310" wall line pipe, API 5LX42, hydrostatically tested to 930# and inspected at mill by established Engineering Company.

Write Box G-334
The Oil and Gas Journal,
Tulsa, Oklahoma

EQUIPMENT FOR SALE

1 OILWELL Steam Pump, 16¼ x 7¾ x 20". This pump is in excellent condition, may be seen at Makin Drilling Company Yard, Hobbs, New Mexico. Makin Drilling Company, Box 1628, Hobbs, New Mexico.

FOR SALE: Jennings, Louisiana, many used steel storage tanks 100 to 37,000 bbl. Hardware, connections and pumps. Southern Oil Agency, P.O. Box 880, Jennings, Louisiana.

FOR SALE: At Madison, Kansas, a large quantity of ⅝" and ¾" sucker rods suitable for reuse, recently reclaimed because of water flood operations, 10c & 15c per foot. Cities Service Oil, Patridge, Bartlesville, Okla.

2—OILWELL 3" x 6" Triplex Power Pumps w/ porcelain plungers. 7—75 HP, 440-V, 900 RPM, Open type electric motors. 13—6 groove D-section sheaves 15" to 34" diameter. 4000'—1½" Cement Lined Pipe. Morrison Producing Company, P. O. Box 712, El Dorado, Kansas.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE
SURPLUS
SHOP EQUIPMENT

1—Lodge & Shipley Hollow Spindle Lathe, 8-⅞" hole, 25" Swing, 16' Bed, Hardened & Ground V-Ways. Purchased new in 1950.
1—Seneca Falls Engine Lathe, 12" Swing x 6' Bed. Motor driven through Turner Unit.
1—Bridgeport 8" Hole Hollow Spindle Lathe. **52" Swing**, 16' Bed. Motor driven through Turner drive.
1—15" R. A. Kelly Company Hydraulic Shaper, Motor Driven.
1—21" Champion Post Type Drill Press, Motor Driven.
1—400 AMP Lincoln Electric Welder. 220 Volt, 60 Cycle, 3p Motor Driven.
1—Kalamazoo P45 Band Saw. Motor Driven.
1—Buffalo 14" Post Type Drill Press. Motor Driven.
1—200-Ton Hydraulic Horz. Press. 10' inside clearance. Motor driven pump.

This is a part of a complete Machine Shop. Location is 2601 Butternut, Abilene, Texas. Inspection may be made at any time. Shop could be readily dismantled and moved or operated at its present location.

PRICED TO SELL

Phone—Wire—Write

Empire Machinery Co.

Box 4028 1613 Tower Petroleum Bldg.
Odessa, Texas Dallas, Texas

EQUIPMENT FOR SALE

WELL drilling equipment, new or used Spudders, rotaries, core & shot hole drills, tools, pipe, bits, blocks, pump jacks, valves Everything for well drilling and service Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE: One 36"x11' 125# WP Std BS&B Vertical Separator complete w/ valves and safety head. One 3 phase 220-440V, 75KW Generating Unit w/all controls built in direct connected to 165 HP GMC Diesel Engine. Phone 9-3193 or box 1724, Billings, Montana.

CASING

IMMEDIATE DELIVERY

5½" O.D. 15.5# J-55 R2 ST&C Sml. New Casing 8RD API Spec. Racked at Houston, Texas. 191.46 Ton or 24,705 Ft. of Japanese made casing. Will sell all or part at $245 Ton plus cost of shipping, duty, etc., from Japan. Write, call or wire collect to

PAUL KOLLSMAN
Waldorf Astoria Towers, 100 E. 50th. St.
New York City, New York
Phone ElDorado 5-3100

WE OWN AND OFFER FOR IMMEDIATE DELIVERY THE FOLLOWING

Unused DC Generators

12 Only	Single Bearing Units
250 KW	40C Continuous
240-120 Volts	125% Load 2 Hrs. 55C
1042-260 Amps	Size 153HD-M-DP
450 R.P.M.	Compound Wound

Manufactured by Crocker Wheeler Electric

6 Only	Single Bearing Units
300 KW	40C Continuous
240-120 Volts	125% Load 2 Hrs. 55C
1250 Amps	Frame 102HD-M-DP
1200 R.P.M.	Stab. Shunt Wound

Manufactured by Crocker Wheeler Electric

1 Only	Single Bearing Unit
300 KW	40C Continuous
120 Volts (NL-FL)	125% Load 2 Hrs. 55C
2500 Amps	Frame CB-208.6B
1200 R.P.M.	Compound Adj. Wndg.

Manufactured by Westinghouse

1 Only	
400 KW	Instruction Book 5107
120-240 Volts	Drip Proof Enclosure
1200 R.P.M.	Serial 3516 P10
1667 Amps	Single Bearing Unit

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ELiot 6561

EQUIPMENT FOR SALE

GAS METERS FOR SALE. Westcott, Foxboro and Emco. Good condition. Geo. R Milner, Box 124, Okmulgee, Oklahoma.

FOR SALE: One Barrel Type Ethyl Lead Plant, Hutex Oil & Refining Company, P. O. Box 2146, Houston, Texas.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE

1—Building 24′ x 75′, Steel Frame, C. I. Boiler House
1—Engine, 18 x 20 Type 8-190 HP C. G. Cooper (Generator engine)
5—Engines 18 x 20 Type 75-170 HP C. G. Cooper (Compressor engines)
3—5′ x 20′ Riv. Steel Gasoline Storage Tanks
6—10′ x 40′ Riv. & Welded Steel Gasoline Storage Tanks
1—Fractionating Still 30″ x 36′, Petr. Eng. Co.
1—Stabilizer, 48″ x 30″ x 24″ x 34′, Tulsa Type.

Compressor cylinders, Braun Heat exchangers, preheaters, Pumps, Motors, scrubber Tanks & volume Tanks.

BANKOFF PIPE & SUPPLY COMPANY
P. O. Box 2301, Tulsa, Oklahoma
Phone 6-2119

IMPORTED CASING For Sale

14,812′ 8″

5½″ x 15.5#, J-55, S. T&C, Range 3, Prime, Seamless, API casing, Belgian origin, PRICED RIGHT. Also other sizes in stock.

BARON TUBE COMPANY
722 Oliver St., N.W. Atlanta, Ga.
Phone: Atwood 9721

TWO FAILING 1500 heavy duty drills with 4½ x 6 pumps, automatic pulldown, and mounted on International trucks. Write P. O. Box 819, Longmont, Colorado. Phone 1333.

FOR SALE: Two Denver-Gardner 5 to 7¼ x 10, Figure FO-FXO, power pumps. Like new condition. $3500.00 each. J. A. Finlayson, 108 E. 4th St., Tyler, Texas. Phone 3-3563.

FOR SALE: 2—New B. J. Multiplex 6 x 8 x 10 pipe line pumps, 1000 Gal. @ 400 ft., maximum head 2000′, List $3468.00 each, Our Price $1250.00 each. Bender Oil Operations, P.O. Box 52, Bakersfield, California.

25,000′ 8⅝″ OD 28# Used LW PE Line Pipe DRL. $1.85 per foot f.o.b. May, Texas.

FRANK MORRIS AND COMPANY
424 South Cheyenne St., Tulsa, Oklahoma
Telephone 2-6247

FOR SALE

1—U4 International engine. 1—U6 International engine. 1000 ft. new 2⅞ Joy Mfg. drill pipe. 1—2⅞ Joy core drill swivel. 1—Skid-mounted "A" rod drill head. 2—4 x 5 Gardner-Denver pumps. 1—3 x 4 Gardner-Denver pump.

Located Wichita Warehouse
Ainsworth, Inc., 917 Union Nat'l Bank Bldg., Wichita, Kansas. Phone 3-3785, 6-6823.

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1¼″ PRESSURE and TEMPERATURE RECORDERS

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OIL FIELD RESERVOIR ANALYSIS EQUIPMENT

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FOR SALE

Seismograph Service Corp. 24 channel instrument truck, completely overhauled, all instruments put in like-new condition. 26 amplifiers, 28 galvanometers, 30 geophones (Midwestern Type 200), 2 new 1400′ cables. Instrument cab completely new, all steel construction, stainless steel lined with 1/16″ stainless steel floor welded over 3/16″ steel sub-floor. F6 Ford truck, aprox. 5,000 miles, completely repainted, equipped with heavy-duty front bumper and brush guard, fender clearance increased and heavy-duty raised running boards installed, has turning lights and Leech-Neville generator for battery charging.

Priced Exceptionally Low . . . For Immediate Sale

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MIDWESTERN
GEOPHYSICAL LABORATORY

EQUIPMENT FOR SALE

FOR SALE: 40,000 ft. ±1 3½″ O.D. standard plain end line $0.55 per ft. 20,000 ft 4 O.D. flues. Rogers Pipe and Supply Company. Phone 5-8850, Tulsa, Oklahoma

TWO Hydraulic Pipe Pulling machines, good condition. One mounted on Half-track, one on trailer. Ace Duncan, Telephone 2-1414, Tulsa, Oklahoma.

FOR SALE: Sullivan "300-A" drilling rig, complete with 2—Buda engines, one practically new, draw works, rotary table, 65′ derrick with 20′ section to pull doubles; Wheatley 7 x 10 mud pump, swivel, traveling block, kelly, etc. All mounted on tandem trailer. Excellent rig for drilling to 3000′ or deep core drilling. Rig in excellent condition. Price less drill pipe $24,000.00. Contact Box 1022 or Phone 813, Del Rio, Texas, for inventory.

JOY 300 Drilling Rig butane powered, mounted on Brockway 6x6 truck. 3500 feet 3½ inch drill pipe. Auxiliary mud pump and butane engine as separate unit. All tools and equipment included. This rig in first-class working condition and can be seen working now. Call or write Steele Brothers, Crete, Nebraska. Phone 127.

COUPLINGS For Sale: 5,000 8⅝″ O.D. Recessed Couplings, off of 28.55# pipe; priced $1.50 each; 2000 10¾″ O.D. off of 41# pipe, recessed; 2500 12¾″ O.D. recessed; all of the above 8V thread. All couplings cleaned and in first-class condition. A. A. Gilbert Pipe & Supply Co., P. O. Box 986, Shreveport, La.

FOR SALE

Approximately 50 power cylinder heads for Worthington LTC compressors and 50 power cylinder heads for R.A. Series Clark compressors, used but in good condition; subject to inspection. Price: Worthington heads $55.00 ea., Clark heads $40.00 ea., f.o.b. shipping point. United Iron & Machine Works, 249 N. Port Ave., Corpus Christi, Texas, phone 4-5453.

MOUNTED Rotary Drilling Rig, Dodge Truck, 1500 feet, Two Men Operate, Fast, Durable, Efficient, Roller Bearing, Money Maker. $5000. Box 106, Seminole, Oklahoma

CARDWELL R. L. 3 Drum Spudder, equipped with lots of extras, including rotary drive clutch. G.K.U. Waukesha Motor. All in A-1 condition. Just shut down on 7800′ well. Can be seen on our yard in Midland, Texas. Call C. A. Hurst Drilling Co., Midland, Texas, phone 3-3532 or Mr. Vaught 2-2088.

FOR SALE: 6000′ 4½″ OD Sonoscoped Drill Pipe, 4500′ 3½″ Reg. Drill Pipe. Rotary & Cable Tool Equipment. Giffin & Thompson Supply, Phone 477, Hoisington, Kansas.

FOR SALE: 3 joints 30″ x ½″ wall x 25′ pipe "NEW." Bayou Welding Works, Box 78, New Iberia, Louisiana.

FOR SALE: Cardwell, model RL, Beam type cable tool drilling unit. At present in operation in West Central Kansas. Complete inventory and price furnished on request. K & A Drilling Co., Phone 448R or Box 497, Ellinwood, Kansas.

USED ROTARY, cable tools, and production equipment. E. A. Kelly, 3131 S.E. 29th Street, P. O. Box 861, Oklahoma City. Phone Jackson 36407.

FOR SALE: Madison, Kansas, two used 16″ x 20″ Horizontal Gaso Vacuum Pumps, each $200.00. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE at Lima, Ohio, Refinery—Regular accumulations of American Cyanamide M.S. synthetic equilibrium catalyst UPO Activity 26. The Standard Oil Company (Ohio), Midland Bldg., Cleveland 15, Ohio. R. L. Charles.

600 FEET 2⅞—10.4#, range 1 drill pipe with 2⅞ API Internal Flush tool joints. 825 feet 2⅜—6.65#, range 1 drill pipe with 2⅜ API Reg. tool joints. 750 feet 2⅜—6.65#, range 1 drill pipe with 2⅜ API Internal Flush tool joints. All $2.00 per foot. P & S Engineering Company, 5006, Bartlesville, Oklahoma.

FOR SALE in the Russell-Great Bend, Kansas Area approximately 150,000′ of 2″ water line buried 30-36″ deep which will be available for reclaim during wheat harvest and wheat planting period. Cities Service Oil, Patridge, Bartlesville, Okla.

EQUIPMENT FOR SALE

FOR SALE: Fort Worth Super J. Spudder, skid mounted, V-Belt drive, 60' pipe mast. Cummins diesel engine Model-H. Some other equipment if desired. Wilson Drilling Company, Box 5656, Eldorado, Texas.

FOR SALE: 8—Shriver 42"x42" cast iron Filter Presses, Plate & Frame type, 18, 27, and 54 chambers, 1" cake; 18—Sperry 18"x18" cast iron Filter Presses, 11 chambers; 2—#12 Sweetland Filters for 36 leaves on 4" centers. Immediate shipment. Attractively priced. Consolidated Products Co., Inc., 17-20 Park Row, New York 38, N. Y. BArclay 7-0600.

FOR SALE—At Oklahoma City, N-7 Brewster Rig with 3 NKU Waukesha Engines, D-500 Emsco Pump, 127 ft. Lee C. Moore Mast with 7 ft. Substructure, and with or without drill pipe. All in excellent condition and complete in every respect. Box G-347, The Oil and Gas Journal, Tulsa, Oklahoma.

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HELP WANTED

OIL Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974. Tom Robinson, owner. For Technical and Trained Personnel, including LPG.

REGISTERED professional engineers experienced in evaluation oil and gas properties by major oil company headquarters Tulsa. State experience and qualifications. Box 521, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

WELL geologist, graduate, minimum six years' experience. One year contract, foreign work. Prefer single man with considerable experience in drilling operations. Liberal salary for man with proper qualifications. Box G-355, The Oil and Gas Journal, Tulsa, Oklahoma.

DIVISION Geologist with Louisiana Gulf Coast regional subsurface experience required by sound, substantial company in New Orleans. In reply, please state salary expected and give details of education and experience. Replies confidential. Box G-313, The Oil and Gas Journal, Tulsa Oklahoma.

WANTED: High salaried oil office executive, with experience in handling organization partly abroad. Office in New York. Man 40 to 50 preferred. All correspondence will be absolutely confidential. Box G-353, The Oil and Gas Journal, Tulsa, Oklahoma.

MANY Rocky Mountain Petroleum Industry openings for geologists, engineers, draftsmen, and refinery supts. Write Professional Placement Service, 516 University Bldg., Denver, Colo.

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Box G-357

THE OIL AND GAS JOURNAL

Tulsa, Oklahoma

HELP WANTED

WANTED—Seismograph Party Chief. Must be fully qualified. Age 27-38. A good opportunity for the right man. Box G-348, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC Party Chief for work in United States with degree in Geophysics, Geology, or Engineering, age 26 to 35, capable of advancing, in small progressive Contract Seismograph Company. Must be good interpreter. Salary commensurate with ability. Please include education and complete brief of experience in first reply. Replies confidential. Box G-351, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Chemical Engineers and Chemists with or without experience for positions in Research and Development department, located in Tulsa. State qualifications and salary expected. Write Personnel Department, P. O. Box 381, Tulsa, Oklahoma.

SEISMIC PERSONNEL needed for United States and Canada by well known and expanding contract geophysical company. Address Box E-863, The Oil and Gas Journal, Tulsa, Oklahoma.

PIPE LINE WELDER, at least 4 years' experience in welding on loaded crude lines. Must be able to supervise and direct small maintenance gang in addition to regular duties as welder. Location, North Central Area. Age—25-45. Box G-358, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PETROLEUM Engineer, ten years' experience with major oil company, desires responsible position with independent operator. Box G-325, The Oil and Gas Journal, Tulsa, Oklahoma.

QUALIFIED SECRETARY — With extensive oil experience desires position with independent oil company or oil operator. Box G-345, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer, 3½ years experience. Presently employed as Drilling Engineer. Age 32. Available late spring. Resume on request. Box G-333, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM - MINING, Geologist, 43, married. 20 years western United States. Presently employed. Seeks position directing exploration oil and minerals. Salary commensurate with ability and experience. Excellent references. Box G-361, The Oil and Gas Journal, Tulsa, Oklahoma.

PURCHASING Agent desires employment with well established firm. Excellent references. Present employer has suspended operations indefinitely. Experience: twelve years, purchasing, major oil company; seven years successfully self employed; past years as Expeditor and Purchasing Agent for Aircraft parts manufacturer. Please write P. O. Box No. 461, Ponca City, Oklahoma, or telephone 5685.

GEOLOGIST-ENGINEER: Age 35, experienced in valuation of drilling prospects and producing properties, production engineering, leasing, and deal negotiations. Wide acquaintance in petroleum industry and risk capital groups. Graduate Geologist, University of Tulsa, 1939. Desires position with independent company or individual. Box G-362, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Petroleum Engineer, 34, single, 4 years varied drilling and production experience on Gulf Coast and Permian Basin desires connection with strong independent in Permian Basin or Southwest Texas as production engineer or reservoir engineer. Box G-311, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer, 7 years major company experience, Gulf Coast and West Texas, production, drilling, and reservoir analysis. Employed, married, age 31. Desires position with independent. Box G-309, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1628, Ph. No. 3-3141, Hobbs, New Mexico.

SITUATIONS WANTED

GRADUATE PETROLEUM ENGINEER. Married, age 32, 7 years experience production and drilling, Gulf Coast area. Desires permanent position w/growing organization. Box G-337, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer, 9 years' experience in completion, production and workovers, desires responsible position with active independent. Presently located in West Texas. Write Box G-354, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGER or assistant manager, 42, truck transportation or wholesale gasoline agency. 13 years' experience independent refinery. Box 322, Big Spring, Texas.

GRADUATE teacher: completed two contracts in Venezuela, one two year contract in Arabia. Chicago experience in all grades. Available September for other foreign assignments. Box G-359, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

PRODUCING ROYALTY and overrides for sale. Wire-write-call for particulars. JACK EAGLE, 706 City Natl. Bldg., Okla. City, Okla. REgent 6-7027.

QUICK CASH: Producing royalties, Overrides or Production . . . no delay. Phone 72-4533, Robert L. Kinkaid . . . P.O. Box 26, Tulsa, Oklahoma.

PRODUCING royalty in undeveloped field, Newton County, Texas. 13.2 royalty acres under 567 acre lease. One oil well, one shut-in distillate well, two sands. $81.64 monthly average 5 months. Will sell all or half for $550 an acre. Also Louisiana producing royalty. C. B. Humphrey, Box 722, Jennings, La.

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WANTED

WANTED to purchase Petroleum statistical guide (Vance Rowe) monthly reports for Western Kansas—years 1941 through 1952 in good readable condition. Box G-360, The Oil and Gas Journal, Tulsa, Oklahoma.

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W. J. PETERMAN, Geologist
Portales, New Mexico

Bowman Made Divisional Vice President by Rockwell

G. T. BOWMAN

L. A. Dixon, Jr., vice president of meter and valve division, Rockwell Manufacturing Co., has announced the appointment of Gilbert T. Bowman as sales manager of both the Nordstrom and Gas Products divisions of the company. Bowman joined Rockwell in 1939 as a sales engineer assigned to the Northern California territory. Later he directed the sales and services of the San Francisco district office.

In August 1951 he was transferred to Pittsburgh as sales manager of Gas Products. The Nordstrom Valve division was put under his jurisdiction when its previous manager, H. Gottwald, was promoted to regional sales manager of the Eastern region. In his new duties Bowman will continue to make his headquarters at the Rockwell home office in Pittsburgh.

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LEGAL

SEALED BIDS will be received until 2:00 p.m. PST, March 20, 1953, at the office of the Superintendent, Warm Springs Indian Agency, Warm Springs, Oregon, for the sale of oil and gas mining leases on 5,586.47 acres of trust allotments of the Burns-Paiute Indians in Harney County, Oregon. For further information, address the Superintendent, Warm Springs Indian Agency, Warm Springs, Oregon.

LEGAL

Sealed bids will be received at the office of the Area Director, Bureau of Indian Affairs, Room 365, Federal Building, Albuquerque, New Mexico, until 2:00 o'clock, P.M., M.S.T., March 17, 1953, and then publicly opened for sale of oil and gas leases on 15 tracts of Jicarilla Tribal Indian lands, totaling 38,672.46 acres, more or less, located in the Rio Arriba County of New Mexico on the Jicarilla Indian Reservation. Each tract containing four sections each, is offered for lease separately. For complete description of the land, location, provisions and stipulations of the leases to be sold, address the Superintendent Jicarilla Indian Agency, Dulce, New Mexico.

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